**Course guide**  
**820530 - QAQ - Analytical Chemistry**

**Unit in charge:** Barcelona East School of Engineering  
**Teaching unit:** 713 - EQ - Department of Chemical Engineering.

**Degree:** BACHELOR’S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Compulsory subject).

**Academic year:** 2022  
**ECTS Credits:** 6.0  
**Languages:** Catalan, Spanish

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### LECTURER

**Coordinating lecturer:** ANTONIO FLORIDO PEREZ

**Others:**

Primer quadrimestre:
- RICARD DEVESA GARRIGA - M20
- ANTONIO FLORIDO PEREZ - M20

Segon quadrimestre:
- JOAN DE PABLO RIBAS - T10
- ORIOL GIBERT AGULLO - T10

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### PRIOR SKILLS

Chemistry  
Aqueous solution chemistry

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### REQUIREMENTS

QUÍMICA EN DISSOLUCIÓ AQUOSA - Prerequisite

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### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

**Specific:**
CEQUI-19. Understand mass and energy balances, biotechnology, mass transfer, separation operations, chemical reaction engineering, the design of reactors, and the recovery and processing of raw materials and energy resources.

**Transversal:**
- 07 AAT N2. SELF-DIRECTED LEARNING - Level 2: Completing set tasks based on the guidelines set by lecturers. Devoting the time needed to complete each task, including personal contributions and expanding on the recommended information sources.
- 05 TEQ N1. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.

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### TEACHING METHODOLOGY

The methodology consists on theoretic lessons where the teacher presents the learning objectives in relation to the contents of the subject. The contents are subsequently applied to solve practical problems. In these practical problems students are encouraged to actively participate. Real cases related to both industry and environment are also developed in order to learn choosing the adequate analytical techniques.

The adequate material and tools for the learning process are available for the students. The Digital Campus is also a web tool that is being used in order to give the students different material of the subject and in addition it is a tool to improve the communication between teachers and students.
LEARNING OBJECTIVES OF THE SUBJECT

The global objective of Analytical Chemistry is the students to learn the basic principles and applications (industrial and environmental) of the analytical chemistry, including classic and instrumental techniques. At the end of the lessons, the students should be capable to:
1) Describe the scientific basis and most important applications of classic and instrumental techniques in analytical chemistry.
2) Distinguish the chemical needed pre-treatment of a sample before using any analytical technique.
3) Determine the concentration of any analyt in a sample by using titrating techniques.
4) Select the adequate analytical technique for the determination of the concentration of a solute in a sample.
5) Transform the signal of any instrumental technique in concentration units.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>90.0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>60.0</td>
<td>40.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

-Tema 1. INTRODUCTION TO ANALYTICAL CHEMISTRY

Description:

Full-or-part-time: 18h
Theory classes: 8h
Self study: 10h

-Tema 2. CLASSIC METHODS IN ANALYTICAL CHEMISTRY

Description:
- Complexometric titrations: Titrination curves. Titrants, metalochromic indicators.
- Precipitation titrations: Titrination curves, tetrants and indicators.
- Redox titrations: Titration curves, redox tetrants and indicators. Pre-treatment of the sample. Titrations with strong oxidants (permanganate and dichromate) and with strong reductants. Redox titrations with iodine.
- Industrial and environmental applications of titrations.

Full-or-part-time: 56h
Theory classes: 20h
Self study: 36h
- Tema 3. ELECTRONANALYTICAL METHODS

Description:
- Classification of electroanalytical techniques.
- Conductimetry: fundamentals, instrumentation and conductimetric titrations.
- Industrial and environmental applications of electroanalytical methods.

Full-or-part-time: 25h
- Theory classes: 10h
- Self study: 15h

- Tema 4. SPECTROSCOPIC METHODS

Description:
- Absorption and emission of light. Classification of the spectroscopic methods.
- Fluorescence. Fundamentals and instrumentation. Qualitative and quantitative analysis
- Industrial and environmental applications of spectroscopic methods.

Full-or-part-time: 27h
- Theory classes: 12h
- Self study: 15h

- Tema 5. CHROMATOGRAPHY

Description:
- Fundamentals. Parameters of the columns. Classification.
- Gas-chromatography (GC). Instrumentation.
- Qualitative and quantitative analysis. Industrial and environmental applications.

Full-or-part-time: 24h
- Theory classes: 10h
- Self study: 14h

GRADING SYSTEM

Assessment qualification (NF):
NF = 0.20*AP1 + 0.20*AP2 + 0.60*PG
where
1) AP1: Exam 1
2) AP2: Exam 2
3) PG: Final Exam

This subject has a re-evaluation test and the EEBE regulations will be applied. The students will be able to access the re-assessment test that meets the requirements set by the EEBE in its Assessment and Permanence Regulations (https://eebe.upc.edu/ca/estudis/normatives-academiques/documents/eebe-normativa-avaluacio-i-permanencia-18-19-aprovat-je-2018-06-13.pdf)
BIBLIOGRAPHY

Basic:

Complementary:

RESOURCES

Other resources:
The professors provide some support notes to the students as a study aid. Thus, the contents of these notes is:
- A collection of problems of each topic.
- Tables, graphs and figures.
- Articles, interesting Web pages, solved past papers, etc.
Furthermore, additional information about activity dates or examination grades are also given.