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

LECTURER

Coordinating lecturer: ANTONIO FLORIDO PEREZ

Others: Primer quadrimestre:
ANTONIO FLORIDO PEREZ - Grup: M2
ORIOL GIBERT AGULLO - Grup: M2

PRIOR SKILLS

Chemistry
Aqueous solution chemistry

REQUIREMENTS

QUÍMICA EN DISSOLUCIÓ AQUOSA - Prerequisite

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUITS

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.

TEACHING METHODOLOGY

The methodology consists of 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>
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</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: Titration curves. Titrants, metalochromic indicators.
- Precipitation titrations: Titration curves, titerants and indicators.
- Redox titrations: Titration curves, redox titerants 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):

\[ NF = 0.20 \times EP1 + 0.20 \times EP2 + 0.30 \times EF1 + 0.30 \times EF2 \]

where

1) EP1: Exam 1  
2) EP2: Exam 2  
3) EF1 and EF2: Final Exams

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.