

## COURSE: ANALYSIS OF INDUSTRIAL PRODUCTS

**SUBJECT:** Industrial and Experimental Analysis

**MODULE:** Specific

**PROGRAM:** University Master's Degree in Analytical Chemistry

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### GENERAL FEATURES \*

**Type:**  Basic Training  Compulsory  Elective

Master's thesis work,  Practicum

**Duration:** Semester

**Semester / s:** 2

**Number of ECTS credits:** 5

**Language / s:** Spanish, Catalan, English

### DESCRIPTION

**BRIEF DESCRIPTION AND JUSTIFICATION** (The meaning of the course in relation to the program. Between 100 and 200 words.)

The general objective of the Master in Analytical Chemistry by the Ramon Llull University is to provide students with the necessary tools to face an analytical process in a global way. For this reason, it is important for the students to acquire enough knowledge on the main matrices to which analytical processes are applied.

Within the main matrices are those of diverse industrial origin. The basic objective of this subject is to provide students with chemical knowledge of these products from an analytical point of view.

**COMPETENCES** (Of course you put in relation to the skills pre-assigned in the field.)

#### **Basic competences**

CB6 - Have and understand knowledge which provides the ground or opportunity to be innovative in the development and/or application of ideas, often in a research context

CB7 - Apply their knowledge and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study

CB8 - Integrate knowledge and deal with the complexity of formulating judgments based on information which, being incomplete or limited, includes reflections on social and ethical responsibilities related to the application of their knowledge and judgments

CB9 - Communicate conclusions, and the reasons that sustain them, to specialized and non-specialized audiences in a clear and unambiguous way.

#### **General competences**

CG1 - Ability to lead, direct and manage projects in academic or business environments adapting to the structures, needs and ways of operation of each institution

#### **Specific competences**

E19 - Demonstrate advanced knowledge of analytical methods for the determination of majority and minority components, impurities and functional properties in raw materials,

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metals, polymers, ceramics and formulated products as well as of specific analytical techniques for these types of samples.

E20 - Ability to interpret the analytical results obtained in samples of raw materials, metals, polymers, ceramics and formulated products obtained with general analytical techniques or specific for these types of samples.

### ***Transversal competences***

T1 - Ability to communicate in English and use English as a working language

T3 - Ability to assess the impact of the use of chemistry in the sustainable development of the society

**PREREQUISITES \*** (Modules, materials, disciplines or expertise needed to track the subject. Contain subjects that must have been completed can be made.)

Students who have accessed the master's degree from bachelor's degrees in chemistry will not need any additional training complement. For the other degrees, they must have previously studied subjects that included basic contents of instrumental analytical chemistry and structural elucidation (including mass spectrometry).

**CONTENTS** (Sections that make up the syllabus, to a second level of detail.)

1. Characterization of materials
  - 1.1. Introduction
  - 1.2. Scanning electron microscopy and microanalysis
  - 1.3. Transmission electron microscopy
  - 1.4. X-ray fluorescence
  - 1.5. Electronic spectroscopy for chemical analysis ESCA-XPS
  - 1.6. Auger Electron Spectroscopy
  - 1.7. SIMS secondary ion mass spectrometry
  - 1.8. GDOES
  - 1.9. Thermal Analysis
2. Metallic and polymeric materials
  - 2.1. Iron based alloys
  - 2.2. Non-ferrous materials
  - 2.3. Determination of carbon, oxygen, nitrogen and sulfur
  - 2.4. Chemical analysis in polymeric materials
3. Ceramic materials and glass
  - 3.1. Composition / structure relationship
  - 3.2. Wet methods of analysis
  - 3.3. Direct methods of analysis
4. Chemical products
  - 4.1. Analytical methods
  - 4.2. Physical properties

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- 4.3. Practical Cases
- 5. Detergents
  - 5.1. General issues
  - 5.2. Analysis of surfactants
  - 5.3. Analysis of other components
- 6. Radiochemical analysis
  - 6.1. Radiochemical methods
  - 6.2. Chemical analysis by radiochemical methods
  - 6.3. Applications
- 7. Oil derivatives
  - 7.1. Hydrocarbon analysis
  - 7.2. Analysis of lubricants
  - 7.3. Analysis of refrigerants
- 8. Paints and coatings
  - 8.1. Composition
  - 8.2. Pigment analysis
  - 8.3. Analysis of other components
  - 8.4. Tests on coatings

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### METHODOLOGY

**TRAINING ACTIVITIES** \* (Complete the table relating activities, workload in ECTS credits, and skills.)

Training Activities	ECTS	Competences
Sessions of exposition of concepts	31 / 1.15	E19, E20, T3
Sessions solving exercises, problems and cases	4 / 0.15	E19, E20, T3
Seminars	2 / 0.07	
Presentations	4 / 0.1	E19, E20, T1, T3
Activities of personal study by students	90 / 3.33	E19, E20, T3
Evaluation activities (exams, monitoring controls ...)	4 / 0.15	E19, E20, T3
<b>TOTAL</b>	<b>135/ 5</b>	

**TEACHING METHODOLOGY** (Justifying the teaching methods used in relation to the competences and contents of the course. Between 100 and 200 words.)

- Sessions of exposition of concepts: Exposition of contents through presentation or explanation (possibly including demonstrations) by a professor.
- Sessions solving exercises, problems and cases: Solving exercises, approach / problem solving and presentation / discussion of cases by a professor with the active participation of students.
- Seminars: Statement made by a teacher in order to review, discuss and answer questions about materials and topics presented in the sessions of exposure sessions concepts and solving exercises, problems and cases.
- Presentations: Oral presentation to a professor and possibly other students by a student. It can be a paper prepared by the student by searching the published literature or a summary of a practical or project undertaken by the student.
- Activities of personal study by students: Personal work required of the student to acquire the competences of each subject and assimilate the knowledge presented in the sessions of exposition of concepts and of solving exercises, problems and cases, using, when necessary, the consultation recommended material.
- Evaluation activities: Oral and/or written statements made during a semester or after it.

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### EVALUATION

**ASSESSMENT SYSTEM \*** (Complete the table relating evaluation methods, competences and weight in the course grade.)

Evaluation Methods	%	Competences
Final Exam	50%	E19, E20, T3
Monitoring activities	25%	E19, E20, T3
Projects and presentations	20%	E19, E20, T1, T3
Participation	5%	E19, E20, T1, T3

**LEARNING OUTCOMES** (Explanation of the embodiments that allow the student skills assessment, relating them to the skills and methods of assessment.)

The student must demonstrate knowledge of the main sampling methods of industrial matrices. (E19, E20)

The student must demonstrate knowledge of the main analytical methods for the determination of chemical compounds in industrial matrices. (E19, E20)

The student must demonstrate knowledge of specific analytical methods for the determination of chemical compounds in industrial matrices. (E19, E20)

The student must demonstrate his ability to interpret the results obtained in the determination of chemical compounds in industrial matrices. (E20, T3)

The student must demonstrate knowledge of the main standards that are applied in the industrial analysis. (E19)

The student must be able to communicate effectively both orally and in writing, to communicate in English and to use English as a working language, and to work in a multidisciplinary environment individually or as a member of a team. (T1, CG1)

**QUALIFICATION** (Explanation of the computer system of the course grade.)

The grade of this course is obtained:

<b>Final exam</b>	50%
<b>Monitoring activities</b>	25%
<b>Projects and presentations</b>	20%
<b>Participation</b>	5%

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**ASSESSMENT OF THE COMPETENCES** (Define calculation expressions for each competence and the relevant evaluation methods.)

The competences are evaluated with the qualification of the subject.

### **BIBLIOGRAPHY** (Recommended and accessible to students.)

Encyclopedia of analytical chemistry: applications, theory and instrumentation. John Wiley & Sons.

Annual Book of ASTM Standards. ASTM International  
Normas UNE. AENOR

### **DOCUMENT HISTORY**

**PREVIOUS CHANGES** (You set the date and author / s, the most recent first)

January 2015, Dr. Jordi Abellà

February 2016, Dr. Jordi Abellà

**LAST REVISION** (Indicate date and author / s.)

September 2016, Dr. Jordi Abellà