COURSE DATA

DATA SUBJECT

Code: 36458
Name: Chemical Industrial Analysis
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1110 - Degree in Chemistry	Facultat de Química	4	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1110 - Degree in Chemistry	Analytic Chemistry Applied	ELECTIVES

COORDINATION

SIMO ALFONSO ERNESTO

SUMMARY

The subject Chemical Industrial Analysis has been structured in thirteen lessons that aim to give a joint vision of the descriptors of the subject: i) Analytical control of raw materials, ii) the productive process and iii) finished products.

The first three lessons of the subject are an introduction to the basic aspects of industrial analysis from the point of view of the analytical chemist, with special emphasis on sampling and preparation of samples and analysis methods based on the matrix and the concentration of the species of interest.

The following 9 lessons are focused on the main production sectors: i) Agri-food analysis I, ii) Agri-food analysis II, iii) Agri-food analysis III, iv) Pharmaceutical analysis, v) Analysis of plastics, vi) Analysis of paints and varnishes, vii) Analysis of aggregates, viii) Analysis of metals and alloys, ix) Energy sector. In each lesson, the most important samples and analytes of each sector and the analytical techniques used to control the quality of raw materials and finished products will be introduced. The last lesson focuses on green chemistry, where the student is expected to acquire a global awareness of the analytical processes, from the origin of raw materials, production process, manufactured product and final waste generated after the product's useful life.

Regarding to the Sustainable Development Goals (SDGs), in this course it is expected that students will be

able to apply the knowledge learned to contribute to ensuring inclusive, equitable and quality education and promote lifelong learning opportunities for all (SDG 4), to acquire a special sensitivity for sustainable water management (SDG 6), raw materials and energy sources (SDG 7), as well as for sustainable and environmentally compatible development (SDGs 11, 12, 13, 14 and 15), in addition to being able to design, select and/or develop efficient products, chemical processes and/or analytical methodologies (SDG 7) that minimize their impact on the environment (SDGs 14 and 15), take advantage of alternative raw materials and generate less waste (SDG 11).

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

Although enrollment restrictions have not been specified with other subjects of the curriculum, to successfully address the subject, it is necessary that the student knows, both the basis of the Analytical Chemistry courses and associated laboratories, and general concepts such as: i) Nomenclature and chemical formulation, ii) Adjustment of chemical reactions, iii) Elementary stoichiometric calculations, iv) Mathematical and statistical algebra applied to chemical analysis.

COMPETENCES / LEARNING OUTCOMES

1110 - Degree in Chemistry

Act autonomously in learning, making informed decisions in different contexts, forming judgements based on experimentation and analysis, and transferring knowledge to new situations.

At the end of the course, the student will be able to address new problems and develop strategies to solve them.

At the end of the course, the student will be able to apply metrology in chemical processes, including quality management.

At the end of the course, the student will be able to assess risks in the use of chemical substances and laboratory procedures.

At the end of the course, the student will be able to distinguish between qualitative and quantitative aspects of chemical problems.

At the end of the course, the student will be able to distinguish the principles, procedures and techniques used for the determination, separation, identification and characterisation of chemical compounds.

At the end of the course, the student will be able to identify chemical elements and compounds, including their production, structure, reactivity, properties and applications.

At the end of the course, the student will be able to identify the main types of chemical reactions and their key characteristics.

At the end of the course, the student will be able to implement sustainable and environmentally friendly methodologies.

At the end of the course, the student will be able to relate theory and experimentation.

At the end of the course, the student will be able to solve problems effectively.

At the end of the course, the student will demonstrate inductive and deductive reasoning skills.

At the end of the course, the student will demonstrate the ability to analyse, synthesise and apply critical reasoning.

At the end of the course, the student will interpret the data from observations and measurements in the laboratory in terms of their significance and the theories that support them.

At the end of the course, the student will relate chemistry to other disciplines.

Capacidad de análisis, síntesis y razonamiento crítico en la aplicación del método científico.

Collaborate effectively in teams, assuming responsibilities and leadership roles and contributing to collective improvement and development.

Communicate effectively, both orally and in writing, adapting to the characteristics of the situation and the audience.

Comprender las particularidades contables que presenta la regulación jurídico-mercantil de las empresas, relacionando la legislación mercantil aplicable a los distintos tipos operaciones societarias con la contabilidad de los hechos económicos que se regulan. Aprender a relacionar las leyes mercantiles que se ocupan de los concursos de acreedores con la contabilidad, adquiriendo práctica en el manejo de determinados textos legales vigentes.

Contribute to the design, development and implementation of solutions that address social needs, taking the Sustainable Development Goals as a reference.

Demonstrate critical and self-critical reasoning within the field of study, considering aspects such as professional ethics, moral values and the social implications of the different activities undertaken.

Express oneself correctly, both orally and in writing, in any of the official languages of the Valencian Community.

Handle the instrumentation used in the different areas of chemistry.

Understand and recognise, from within the discipline, inequalities based on sex and gender in society; integrate different needs and preferences related to sex and gender into problem-solving and solution design.

DESCRIPTION OF CONTENTS

1. .Introduction to industrial analysis

1.1. The analytical laboratory in the control of industrial processes. 1.2. Analytical problem and analytical process. 1.3. Analytical properties 1.4. Comparison and rejection of values. Control diagrams 1.5. Methods and standards of analysis applied to industrial analysis.

2. Sampling and sample preparation

2.1. Importance of sampling: Sampling plan. 2.2. Gaseous samples Liquid samples Solid samples 2.3. Sample treatments for the determination of inorganic substances: Dissolution, disintegration and dissolution assisted by microwaves. 2.4. Sample treatments for the determination of organic substances: liquid-liquid extraction, Soxhlet solid-liquid extraction, accelerated extraction with solvents, microwave assisted extraction, supercritical fluid extraction, solid phase extraction, solid phase microextraction.

3. Methods of analysis of majority, minority and trace components

3.1. General characteristics of analytical instrumentation: Classification of instrumental techniques. 3.2. Measurement of the observable signal: Linear calibration, Calibration using the standard addition method, Internal standard method. 3.3. Selection of the appropriate method.

4. Agri-food analysis I

4.1. General determinations: Content of water / dry matter, fat, proteins, carbohydrates, ashes, crude fiber.

5. Agri-food analysis II

5.1. Analysis of alcoholic beverages, juices and soft drinks. 5.2. Analysis of milk and derivatives. 5.3. Analysis of meat products.

6. Agri-food analysis III

6.1. Pesticides and phytosanitary products in agricultural and livestock products. 6.2. Heavy metals in fishing products.

7. Pharmaceutical analysis

7.1. Usual instrumental techniques. 6.2. Quality control of active ingredients.

8. Analysis of plastics

8.1. Classification of plastics. 8.2. Quality control of raw materials.

9. Analysis of paints and varnishes

9.1. Usual instrumental techniques. 9.2. Quality control of pigments and charges. 9.3. Quality control of solvents and adhesives.

10. Analysis of aggregates

10.1. Raw materials in quarries and mines. 10.2. Quality control of minerals and cements: Samples solid vs wet digestion.

11. Analysis of metals and alloys

11.1. Usual instrumental techniques. 11.2. Analysis of iron and ferrous alloys. 11.3. Analysis of non-ferrous alloys.

12. Energy sector

12.1. Quality control of raw materials: Oil, gas and coal. 12.2. Solar energy: purity of Si.

13. Green chemistry

13.1. Principles of green chemistry. 13.2. Online decontamination strategies. 13.3 Green evaluation of analytical procedures. 13.4. Control networks.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	9,00
Theory	51,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours

Attendance at other activities	0,00
Individual or group project	25,00
Independent study and work	22,00
Preparation of lessons	24,00
Preparation for assessment activities	19,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

In theory classes the teacher will teach the key concepts of each subject and solve problems type in those subjects that require it. Students will have the necessary material previously in the virtual classroom.

In the seminars students will solve exercises and questions representative of each topic.

In the tutorials a personalized follow-up of the work and the progress of each student will be carried out.

The exercises and questions proposed to be carried out in a non-contact manner will be reviewed and resolved doubts about the subject taught or the preparation of group or individual work.

Non-contact activities may include the resolution of problems and issues that require search of bibliographic information about issues / aspects / topics related to the subject..

EVALUATION

The evaluation of student learning will take into account all the aspects exposed in the methodology section of this teaching guide.

FIRST CALL

Final score:

Part 1 - Activities proposed in the seminars: 20%

(Active participation: 10%, critical reports 5%, solving case studies: 5%)

Part 2 - Activities proposed in the tutorials: 15%

(Issues and problems proposed will be evaluated)

Part 3 - Written exam: 65%

(Theoretical questions and numerical exercises similar to those made in class)

The final grade will be the weighted average of the three parts. To be able to average, the minimum qualification in each of these three parts must be equal to or greater than 4.5. The minimum global grade to pass the subject is 5.0.

NOTE: The student may request in writing to be evaluated only with an exam.

This examination will be composed, in this case, of three parts. One of them will be identical to the exam that the rest of the students will take, it will be carried out simultaneously and will contribute 65% to the overall mark. The other two parts will be composed of a series of questions with which the competences that the rest of the students will have demonstrated will be evaluated through the realization of the activities proposed in seminars and tutorials.

SECOND CALL

In the second call the qualification will be obtained applying the same criteria as in the first call.

Students who failed any of the three parts of the evaluation in the first call must complete an examination of the part (s) not passed.

Final warning

Copying or plagiarism of any assignment that is part of the evaluation will make it impossible to pass the course, and the student will be subject to the appropriate disciplinary procedures.

Please note that, according to Article 13 d) of the University Student Statute (RD 1791/2010, December 30), "*it is the duty of a student to refrain from using or cooperating in fraudulent procedures in evaluation tests, in the work performed or in official University documents*".

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