COURSE DATA

DATA SUBJECT

Code: 36461
Name: Quality and Risk Prevention
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	Second quarter

SUBJECT-MATTER

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

COORDINATION

SAGRADO VIVES SALVADOR

SUMMARY

The subject *Quality and Risk Prevention* is included in the area *Applied Analytical Chemistry*, along with threeother subjects: *Industrial Chemical Analysis*, *Environmental Analytical Chemistry*and the *Applied Instrumental Analysis Laboratory*. They have in common the approach to scientific-technical, applied and practical aspects that future chemists, and in particular analytical chemists, may need in their future professional, training or research activity, based on the knowledge acquired in the previous semesters. In addition, they will also serve as a basis for possible postgraduate and master's courses, such as the Master in Occupational Risk Prevention or the Master in Experimental Techniques in Chemistry.

Quality and risk prevention are current requirements in many of the areas mentioned before. For example, from an analytical point of view, assay laboratories, carrying out chemical analysis, must adopt accreditation systems to survive in an increasingly globalised market, to fit the demands of an increasingly technically formed customer. As all companies (industries), they must be respectful with the environment and adopt risk prevention standards, which ensure the safety and hygiene, largely related to the development of their activity.

The course begins with the development ofthe general concept of chemical risk in the workplace and the environment, and then focuses on chemical agents (occupational health and safety, emissions, dumping, waste), with emphasis on how to evaluate them and on control tools. It then deals with the general concept of quality and quality systems (standards), and then focuses on the accreditation of testing laboratories.

Finally, technical aspects of accreditation are addressed, paying special attention to method validation, among other accreditation requirements.

General objectives of the course are:

¿ That the student acquires an overview of the various elements and approaches, but also laws and regulations that have an impact on aspects of quality, environment and risk prevention, studying in depth the impact of pollutants, and on the accreditation technical requirements in a modern testing laboratory.

¿ That the student acquires knowledge of the different roles and responsibilities that the chemist may have to develop in the chemical industry and in the laboratory, linked to the above-mentioned aspects.

The learning outcomes that are achieved with the competences CG10 (Acquire a permanent sensibility for quality and environment, sustainable development and occupational risk prevention) and CE25 (Develop sustainable and environmentally friendly methodologies) are related to the sustainable development goals. They are specifically the following:
SDG 8: Decent Work and Economic Growth: Promoting full and productive employment and decent work for persons with disabilities.
SDG 12: Responsible Consumption and Production: Ensure sustainable consumption and production patterns.
SDG 13: Climate Action: Take urgent action to combat climate change and its impacts.
SDG 14: Life Below Water: Conserve and sustainably use the oceans, seas and marine resources for sustainable development.
SDG 15: Life on Land: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

In order to be able to address successfully the subject, it is suitable that the student has acquired knowledge during the study of the subjects of Analytic Chemistry and related laboratories, particularly: the problem and the analytical process, significant features of analytical methodologies, main analytical and separation techniques and statistics 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. Chemical risk: evaluation and control.

Chemical risk, evaluation and control. Legislation on the prevention of occupational hazards. Safety and industrial hygiene. Classification of chemicals. Health risks from exposure to chemical agents. REACH regulations (Registration, evaluation, authorization and restriction of chemical substances and mixtures) and CLP (classification, labeling and packaging of chemical substances and mixtures). Chemical risk assessment: exposure limit values and exposure indices, simplified methodologies. Control of chemical risk: actions on the focus, on the environment and on the individual. Fires, explosive atmospheres and confined spaces. Emergency and self-protection plans.

2. Environmental protection: emissions, discharges and residues.

Environmental Protection: emissions, discharges and residues. Environmental legislation: prevention and control of pollution. Control of air emissions. Control of discharges: urban and industrial wastewater. Management and treatment of residues. Integrated Prevention and Pollution Control: Integrated Environmental Authorisation (AAI) and Best Available Techniques (MTD, BAT). Environmental risk assessment. Environmental management systems.

3. Quality

Quality. Concept of quality. Quality management and technical quality. Quality systems in the chemical industry, control laboratories and testing laboratory. Case study: documentation, audits, structure and computerized management of a laboratory.

Accreditation. Concepts of accreditation, certification and homologation. The national accreditation entity.

4. Accreditation

Case study: The norm of accreditation for testing laboratories and the accreditation process

5. Internal Method Validation

Internal Method Validation. Concept of validation. Internal and external validation. Process of internal method validation. Features, requirements and validation criteria. Validation strategies. Case studies: validation reports.

6. Internal Quality Assurance

Internal Quality Assurance. Standardized aspects. Auditable aspects. Repetition of samples. Method Verification. Quality control and control charts. Case studies.

7. External Quality Assurance: Proficiency testing

External Quality Assurance: Proficiency testing. Concepts: assigned values. Process. Case study.

8. Estimation of Uncertainty

Estimation of Uncertainty. Concept of uncertainty. Uncertainty of the result of chemical assays. Standardized aspects for test reports. Sources of uncertainty. Case studies: approaches and trends for the estimation.

WORKLOAD

PRESENCIAL ACTIVITIES

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

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	2,00
Individual or group project	16,00
Independent study and work	28,00
Preparation of lessons	22,00
Preparation for assessment activities	13,00

Resolution of case studies	9,00
Total hours	**90,00**

TEACHING METHODOLOGY

This course consists of theory classes, problems, and case studies, as well as group tutorials.

The **theory classes** will provide an introductory overview of the aspects of quality and prevention of risks at a conceptual level, although emphasizing the technical component. The **problem classes** will lay the foundations for the resolution of questions and problems related to the technical aspects of the subject. In addition, general practical cases will be dealt with, which will serve to work on the overall view of the aspects dealt with and at the same time, as a guide (model) to prepare the evaluation.

In the **group tutorials**, practical cases and transversal competencies will be solved through a discussion on the reports presented by the students, presentation and debate on practical cases (e.g. taken from daily information -fires, explosions, work accidents, environmental catastrophes, ...-, scenarios of risk prevention and technical quality) and obtaining of qualimetric (statistical) information involved in decision making, and the student's ability to solve them will be assessed.

These classes will also serve to raise and resolve any doubts that the student may have concerning questions and problems.

In addition, throughout the course, the students will solve various tasks, critical reports, and standardized records proposed by the professor, which will contribute to the evaluation process.

EVALUATION

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

FIRST CALL

Final grade: the evaluation will be based on a written exam, to be taken on the dates established by the CAT, and on continuous evaluation, corresponding to the completion of activities carried out in group tutorials and other work proposed during the course to be done inside or outside the classroom. In the latter, the delivery within the established deadline will be an assessment criterion.

Note: students who, for objective reasons, cannot attend the face-to-face activities may opt for their substitution by alternative activities that will evaluate the competencies that the rest of the students will have demonstrated through the completion of the activities carried out in the group tutorials. To do so, a written request must be made to the professors within a maximum period of one month from the beginning of the course. It will still be necessary to carry out the rest of the activities proposed to be done outside the classroom.

The weighting to be carried out will be:

Final grade:

Activities proposed during the course and in the tutorials	Exam
35%	65%

The minimum grade of the exam must be equal to or higher than **4.5** to be able to average.

The minimum overall grade to pass the course is **5.0**.

SECOND CALL

The second round will consist of a theory exam and the grade will be obtained by applying the same criteria as in the first round, with the grade of activities and tutorials obtained in the first round.

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*".

REFERENCES

- SAGRADO, S. y otros. Manual práctico de calidad en los laboratorios. Enfoque ISO 17025. 2ª edición, AENOR, Madrid, 2005
- Entidad nacional de acreditación (ENAC). www.enac.es
- Asociación española de normalización y certificación. AENOR. www.aenor.es

- EURACHEM. http://www.eurachem.org/
- AOAC international. http://www.aoac.org/
- Riesgo químico: sistemática para la evaluación higiénica. J. Aguilar Franco y otros técnicos del Centro Nacional de Nuevas Tecnologías, INSHT. INSHT. Madrid. 2010. http://cort.as/-JCxS
- Instituto Nacional de Seguridad, Salud y Bienestar en el trabajo. INSSBT. http://www.insht.es/portal/site/Insht/
- GRAU RÍOS, M., GRAU SÁENZ, M. Riesgos ambientales en la industria. UNED, Madrid, 2006.
- REVOIL, G. Calidad en los laboratorios de calibraciones y ensayos. Mejora de los procesos. AENOR, Madrid, 2003
- COMPAÑÓ, R., RÍOS, A. Garantía de calidad en los laboratorios de análisis químicos. Mejora de los procesos. Síntesis, Madrid, 2002
- Aula Virtual, Recursos: Materiales relacionados con la calidad y la prevención de riesgos.
- Guía para la validación, control de calidad y expresión de la incertidumbre relacionada con los métodos químicos volumétricos. http://www.uv.es/gammmm/
- Guía técnica para la evaluación y prevención de los riesgos relacionados con agentes químicos. R.D. 374/2001. Octubre 2013. INSHT. Madrid. http://cort.as/-JCyw