COURSE DATA

Data Subject	
Code	36461
Name	Quality and Risk Prevention
Cycle	Grade
ECTS Credits	6.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1110 - Degree in Chemistry	Faculty of Chemistry	4	Second term

Subject-matter

Degree	Subject-matter	Character
1110 - Degree in Chemistry	14 - Analytic Chemistry Applied	Optional

Coordination

Name	Department
VERDU ANDRES, JORGE	310 - Analytical Chemistry

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.

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.

OUTCOMES

1110 - Degree in Chemistry

- Develop capacity for analysis, synthesis and critical thinking.
- Show inductive and deductive reasoning ability.
- Demonstrate leadership and management skills, entrepreneurship, initiative, creativity, organization, planning, control, leadership, decision making and negotiation.
- Solve problems effectively.
- Demonstrate ability to work in teams both in interdisciplinary teams and in an international context.
- Demonstrate ability to communicate information, ideas, problems and solutions to both specialist and non-specialist audiences and using information technology, as appropriate.

- Demonstrate a commitment to ethics, equality values and social responsibility as a citizen and as a professional.
- Learn autonomously.
- Acquire a permanent sensitivity to quality, the environment, sustainable development and the prevention of occupational hazards.
- Show knowledge of the metrology of chemical processes including quality management.
- Handle chemicals safely.
- Evaluate the risks in the use of chemicals and laboratory procedures.
- Develop sustainable and environmentally friendly methods.
- Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.
- Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.
- Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.
- Express oneself correctly, both orally and in writing, in any of the official languages of the Valencian Community.
- Have basic skills in the use of information and communication technology and properly manage the information obtained.

LEARNING OUTCOMES

The previous section includes the competences contained in the document VERIFICA. This course deals with part of the learning results of the subject "Applied Analytical Chemistry" which allows acquiring specific knowledge of Chemistry as well as cognitive skills and competences and general competences recommended by the EUROPEAN CHEMISTRY THEMATIC NETWORK (ECTN) for the Chemistry Eurobachelor® Label. The following table lists the learning results acquired in the subject "Quality and Risk Prevention" related to the competencies of the degree in Chemistry.

SPECIFIC KNOWLEDGE OF CHEMISTRY	
The learning process should allow the degree graduates to demonstrate:	
	Competences of the subject “Quality and Risk Prevention” that contemplate the learning outcomes EUROBACHELOR®

The principles and procedures used in chemical analysis and the characterisation of chemical compounds.	Show knowledge of the metrology of chemical processes including quality management..(CE10) Develop sustainable and environmentally friendly methods.(CE25)
COMPETENCES AND COGNITIVE SKILLS	
The learning process should allow the degree graduates to demonstrate:	
	Competences of the subject "Quality and Risk Prevention" that contemplate the learning outcomes EUROBACHELOR®
Competences for the evaluation, interpretation and synthesis of information and chemical data.	Interpret data from observations and measurements in the laboratory in terms of their significance and the theories that underpin them..(CE20).
Ability to calculate and process data, related to information and chemistry data.	Solve qualitative and quantitative problems following previously developed models..(CE14). Recognise and analyse new problems and plan strategies to solve them..(CE15).

COMPETENCES AND COGNITIVE SKILLS RELATED TO THE PRACTICE OF CHEMISTRY	
Ability to perform risk assessments of the use of chemical substances and laboratory procedures.	Develop sustainable and environmentally friendly methods.(CE25). Evaluate the risks in the use of chemicals and laboratory procedures..(CE21).
GENERAL COMPETENCES	
The learning process should allow the degree graduates to demonstrate:	
	Competences of the subject "Quality and Risk Prevention"that contemplate the learning outcomes EUROBACHELOR®
Calculation and arithmetic capabilities, including aspects such as analysis error, estimates of orders of magnitude, and correct use of the units.	Develop capacity for analysis, synthesis and critical thinking.. (CG1). Show inductive and deductive reasoning ability..(CG2). Solve problems effectively..CG4).
Competences in information management, in relation to primary and secondary sources, including information retrieval through on-line searches.	Demonstrate ability to communicate information, ideas, problems and solutions to both specialist and non-specialist audiences and using

	information technology, as appropriate..(CG6). Have basic skills in the use of information and communication technology and properly manage the information obtained.(CT2).
Ability to adapt to new situations and make decisions.	Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration..(CB3).
Skills related to information technology such as word processing, spreadsheet, recording and storage of data, internet use related to the subjects.	Demonstrate ability to communicate information, ideas, problems and solutions to both specialist and non-specialist audiences and using information technology, as appropriate..(CG6). Have basic skills in the use of information and communication technology and properly manage the information obtained.(CT2).
Interpersonal skills to interact with other people and get involved in team work.	Demonstrate ability to work in teams both in interdisciplinary teams

	and in an international context..(CG5). Demonstrate a commitment to ethics, equality values and social responsibility as a citizen and as a professional. (CG7).
Study skills necessary for professional development. These will include the ability to work autonomously.	Demonstrate leadership and management skills, entrepreneurship, initiative, creativity, organization, planning, control, leadership, decision making and negotiation..(CG3). Demonstrate ability to work in teams both in interdisciplinary teams and in an international context..(CG5). Demonstrate the ability to adapt to new situations..(CG9). Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.(CB5).
Ethical commitment to the European Code of Conduct: http://ec.europa.eu/research/participants/data/ref/h2020/other/hi/h2020-ethics_code-of-conduct_en.pdf	Acquire a permanent sensitivity to quality, the environment, sustainable development and the prevention of occupational hazards.(CG10).

	Demonstrate a commitment to ethics, equality values and social responsibility as a citizen and as a professional. (CG7). Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration. (CB3).

These learning results must allow the student to be able to:

1. To know the theoretical and practical aspects necessary to plan, apply and manage the most appropriate analytical methodology to tackle problems of an industrial and environmental nature.
2. Understand and use bibliographic and technical information related to analytical chemical processes.
3. Make rigorous decisions
4. Knowing the tools and principles of sustainable chemistry
5. Knowing the chemical parameters of environmental quality
6. Critical reasoning.
7. Demonstrate ability to manage information.
8. Demonstrate ethical commitment and a gender perspective.
9. To know the theoretical and practical aspects necessary to approach the quality systems of a chemical company.
10. To know the necessary tools to carry out an audit in a chemical company.
11. Assessing the risks in the use of chemical substances and procedures in the chemical company.

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.

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.

4. Accreditation

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

ACTIVITY	Hours	% To be attended
Theory classes	51,00	100
Tutorials	9,00	100
Attendance at events and external activities	2,00	0
Development of group work	8,00	0
Development of individual work	8,00	0
Study and independent work	16,00	0
Readings supplementary material	12,00	0
Preparation of evaluation activities	12,00	0
Preparing lectures	12,00	0
Preparation of practical classes and problem	10,00	0
Resolution of case studies	9,00	0
Resolution of online questionnaires	1,00	0
TOTAL	**150,00**	

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.

REFERENCES

Basic

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