

**COURSE DATA****Data Subject**

Code	36461
Name	Calidad y Prevención de Riesgos
Cycle	Grade
ECTS Credits	6.0
Academic year	2018 - 2019

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 three other 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 of the 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 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

After completing this course, the student should be capable of:

1 to know the necessary theoretical and practical aspects to plan, to apply and to manage the analytical methodology most adapted to tackle problems of industrial and environmental nature

2 to explain in an understandable way phenomena and processes related to the analysis of chemicals used in the industry

3 to understand and use the bibliographical and technical information referred to the analytical chemical processes.

4 to take decisions with rigor

5 to know the hardware and the principles of sustainable chemistry

6 to know the chemical parameters of environmental quality

7 to reason critically.

8 to demonstrate capacity of management of the information



- 9 to demonstrate ethical commitment and with perspective of genre
- 10 to develop experimental procedures for the analysis of industrial products and environmental samples
- 11 to develop skills on bioanalysis
- 12 to know the necessary theoretical and practical aspects to tackle the quality systems of a chemical company
- 13 to know the necessary hardware to realize an audit in a chemical company
- 14 to value the risks for the use of chemical substances and procedures in the chemical company

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. 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**, **practice** and **case study** classes, as well as **group tutorials** and **seminars**.

In **theory classes**, an introductory overview of the aspects of quality and risk prevention, at the conceptual level, will be addressed, emphasizing the technical component. In the **practice classes**, the foundations for the resolution of questions and problems related to the technical aspects of the subject will be provided. Also, general **case studies** that will be used to work the overall treated aspects, and at the same time, to guide the evaluation (like exam models) will be addressed.

In the **group tutorials**, case studies presented will be resolved, serving to evaluate the ability of the student to its resolution. These classes will also serve to raise and resolve doubts arising from the student in relation to issues and problems.

The **seminars** will serve to work the practical point of view of the subjects and to gain skills on them, through discussions on reports submitted by students: visit to an accredited laboratory, presentation and discussion of case studies (e.g. Labels and Material safety data sheets, risk prevention scenarios and technical quality) and information recovery on Qualimetrics (statistics) involved in decision-making.

In addition, throughout the course, students may solve and deliver some critical reports and standardized reports provided by the professor, which will contribute to the evaluation process.

EVALUATION

The assessment of student learning will take into account all the points listed in the section 'Methodology' of this teaching guide.

FIRST CALL

Final Rating:

-

Activities proposed in seminars	Activities proposed in tutorials	Exam
15%	20%	65%



The minimum score for exam must be equal to or greater than **4.5**. The global minimum score to pass the course is **5.0**.

Note:

The student may choose to be assessed only with an examination. To do so, (s)he must request this in writing from the teachers within a maximum period of one month from the beginning of the course.

In that case, this examination will consist in three parts. One of them will be the same exam that will do with the rest of the students and will contribute 65% to the global note. The other two parts shall consist of a series of questions that will assess the competencies that the rest of the students will have demonstrated to own through the implementation of the activities proposed in seminars and tutorials.

SECOND CALL

The second call will consist of an exam and the qualification is obtained by applying the same criteria as in the first call, with the note obtained on first call for seminar and tutorials.

REFERENCES

Basic

- 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 <http://www.insht.es/InshtWeb/Contenidos/Documentacion/CATALOGO%20DE%20PUBLICACIONES%20ONLINE>
- 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.



Additional

- 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.
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