

Academic year
2026/2027

Course Guide:
**QUALITY, ENVIRONMENTAL AND
SAFETY MANAGEMENT**



FACULTY OF
CHEMICAL SCIENCES

1. IDENTIFICATION

Degree Programme	Bachelor's Degree in Chemical Engineering			Course Code	801564
Course Name	Quality, Environment and Safety Management			ECTS	6
Subject Area	Sustainability in Chemical Production				
Module	Chemical Technology				
Course Type	Optional	Year	Fourth Year	Semester	Second
Department	Chemical and Materials Engineering				

Teaching Staff

Activity	Lecturer	Email	Office
Lectures/Seminars/Tutorials	CARLOS NEGRO ÁLVAREZ	cnegro@quim.ucm.es	QB-514
Lectures/Seminars/Tutorials	M ^a CONCEPCION MONTE LARA	cmonte@quim.ucm.es	QB-535

2. OBJECTIVES

General objective

The student should acquire the necessary knowledge for the evaluation and implementation of quality, environmental and safety criteria in industrial processes, according to UNE-EN-ISO standards. Furthermore, the course aims to integrate green chemistry principles into the design of safer, more efficient, and sustainable processes. These skills will enable students to plan management systems and carry out quality, environmental and safety audits.

Specific objectives

- Evaluate and implement quality, environmental and safety criteria in industrial processes.
- Apply tools and indicators for quality, environmental and safety control in industrial processes.
- Implement and document quality, environmental management systems and occupational risk prevention plans in industrial processes according to UNE-EN-ISO standards.
- Acquire the knowledge to plan and carry out quality, environmental and safety audits.
- Communicate effectively with experts in areas of quality, environmental and safety management from other degrees.
- Develop awareness and motivation regarding quality, environment, and safety.
- Understand the REACH regulation.

3. PRIOR KNOWLEDGE AND RECOMMENDATIONS

Prior knowledge

The proper follow-up of this subject requires that the student has previously acquired the knowledge and skills corresponding to the following subjects: “Process Engineering” and “Environmental Technology”. Although enrolment is not formally conditioned by this prior learning, mastery of these subjects is essential for the successful completion of this course.

Recommendations

A basic level of English is recommended to handle bibliography, search information and communicate in writing and orally in that language. Familiarity with IT tools for problem-solving and report writing is also advised. Furthermore, for better use of the subject, it is recommended to enrol in the other subjects within the same subject for better performance.

4. CONTENTS

Brief description

Industrial activity and quality, environment and safety management. Legal framework. The importance of Management Systems. Document structure of a management system. Manuals, procedures, instructions and records. Quality control techniques. Statistical process control. UNE-EN-ISO standards. Design, implementation and monitoring of an environmental or quality management system.

Organisation and management of occupational risk prevention. REACH Regulation. Stages in an audit: pre-audit, audit and post-audit. Internal audits of Management Systems.

Implementation of an integrated management system in selected industrial activities.

Course syllabus

Topic 1. Introduction.

Industrial activity and quality, environment and safety management. Legal framework. The importance of Management Systems. UNE-EN-ISO management standards.

Topic 2. Documentation in management systems.

Importance of documentation. Document structure of a management system. Manuals, procedures, instructions and records.

Topic 3. Quality control.

Quality control techniques. Statistical process control. Acceptance by sampling.

Topic 4. Management Systems.

UNE-EN-ISO standards. Design, implementation and monitoring of a quality management system. Design, implementation and monitoring of an environmental management system.

Topic 5. Prevention of occupational risks.

Organisation and management of prevention. Risks related to safety and environmental conditions in the chemical industry. REACH Regulation.

Topic 6. Audits.

UNE-EN-ISO standards. Definitions and evolution. Stages in an audit: pre-audit, audit and post-audit. Internal audits of Management Systems.

PRACTICAL CASE

Implementation of an integrated management system in selected industrial activities.

5. COMPETENCES

General competences

CG6	Use standards and regulations related to the relevant field of knowledge.
CG7	Analyse and assess the social and environmental impact of the technical solutions identified for a given problem.

Specific competences

CE16-SPQ8	Evaluate and implement Quality, Environmental, and Safety criteria in industrial processes.
CE16-SPQ9	Apply tools and indicators for Quality, Environmental, and Safety control in industrial processes.
CE16-SPQ10	Implement and document Quality Management, Environmental Management, and Occupational Risk Prevention Plans in industrial processes according to UNE-EN-ISO standards.
CE16-SPQ11	Plan and conduct Quality, Environmental, and Safety audits.

Cross-cutting competences

CT1-TQ1	Develop capacity for analysis and synthesis.
CT2-TQ1	Solve problems in the area of Chemical Technology.
CT4-TQ1	Communicate in Spanish using standard audiovisual media.
CT5-TQ1	Consult, use and analyse bibliographic sources in the area of Chemical Technology.
CT5-TQ2	Consult, use and analyse specialised databases and resources accessible through the Internet.
CT8-TQ1	Demonstrate capacity for critical and self-critical reasoning.
CT11-TQ1	Learn autonomously.
CT12-TQ1	Develop sensitivity to the social and environmental repercussions of engineering solutions.

6. WORKLOAD DISTRIBUTION BY ACTIVITY

Activity	In-class (hours)	Self-study (hours)	Credits
Lectures	40	60	4
Seminars	10	15	1
Tutorials/guided work	4	6	0,4
Coursework and examination preparation	3	12	0,6
Total	57	93	6

7. METHODOLOGY

A mixed methodology based on cooperative, collaborative, and self-learning will be followed. This methodology will be developed through:

1. Theoretical classes with master presentations by the teachers and presentations, via computer, of the practical cases carried out by the students.
2. Seminars, for problem resolution, where the use of Excel may be required, and scheduled tutorials.
3. Carrying out practical cases in groups and preparing and taking exams.

The Virtual Campus will be used to allow fluid communication between teachers and students and as an instrument to make available to students the material that will be used in theoretical classes and seminars.

8. BIBLIOGRAPHY

Basic bibliography

- AENOR EDICIONES: "Management systems. UNE standards and related documents"; ISBN: 978-84-8143-713-3, 2010.
- JURAN, J.M.; GRAYNA, F.M.: "Quality control manual. Vol. I and II"; 4th Edition, ISBN: 84-481-0055-7; McGraw Hill, 1993.

Complementary bibliography

- AENOR: "Quality management (2nd edition)"; ISBN: 84-8143-467-1, 2006.
- AENOR: "Environmental management (2nd edition)"; ISBN: 84-8143-466-3, 2006.
- GATELL SÁNCHEZ, CRISTINA; PARDO ÁLVAREZ, JOSÉ MANUEL: "Factors that contribute to the success of an integrated audit"; ISBN: 978-84-8143-734-8, AENOR EDICIONES, 2011.
- MONTGOMERY, D.C.: "Introduction to statistical quality control"; 5th Edition. ISBN: 0-471-65631-3; Wiley, 2005.
- PÉREZ LÓPEZ, CÉSAR: "Statistical quality control: theory, practice and applications"; ISBN: 84-7897-331-1; RA-MA Editorial, 1999.
- SANGUESA, MARTA; MATTHEW, RICARDO; ILZARBE, LAURA: "Theory and practice of quality"; ISBN: 84-9732-406-4; Thomson Editores Spain Paraninfo, S.A, 2006.
- SÁNCHEZ-TOLEDO LEDESMA, AGUSTÍN; FERNÁNDEZ MUÑIZ, BEATRIZ: "How to successfully implement OHSAS 18001"; ISBN: 978-84-8143-726-3, AENOR EDICIONES, 2011.

9. EVALUATION

The student's academic performance, which will be evaluated continuously, and the final grade of the subject will be computed in a weighted manner based on the following percentages, which will be maintained in all calls:

❖ WRITTEN EXAMINATION: 50%

The knowledge acquired and the abilities to analyse problems will be evaluated through controls during the course (30%) and a final exam (70%). Minimum rating: 4 out of 10

❖ **PERSONAL WORK: 25%**

The evaluation of the individual learning work carried out by the student will be carried out taking into account the student's skill in solving the problems and/or questionnaires given by the teacher in the seminars. Minimum rating: 4 out of 10

❖ **GUIDED ACTIVITIES: 25%**

In the tutorials, with mandatory attendance, students will carry out in groups a practical case of implementation of an integrated management system in selected industrial activities, which will be presented in class in different sessions. To evaluate this activity, the teacher will take into account:

- The quality of the computer presentation and the ability to speak.
- Clarity in the presentation and in the answers to the questions posed by the teacher and/or by classmates.
- The quality of the written report, in terms of content and presentation.

Minimum rating: 4 out of 10

❖ **ATTENDANCE AND ACTIVE PARTICIPATION IN CLASSES**

In order to pass the subject, it is mandatory that the student participates in at least 70% of the face-to-face activities and 100% of the scheduled tutorials.

To pass the subject it is necessary to obtain a final grade equal to or greater than 5 out of 10. The final grade will result from the weighted average of the evaluable activities. However, to pass the subject it will be necessary to achieve the minimum grade established in each of them. If this requirement is not met, the final grade will be the weighted average obtained, with a maximum of 4.5 out of 10.

The grades of the activities planned for the evaluation of the subject (controls, tutorials, delivery of problems...) will be communicated to the students sufficiently in advance before the final exam, so that they can adequately plan the study of this or other subjects. In any case, the minimum period of seven days will be respected between the publication of the grades and the date of the final exam of the subject.



ACTIVITY SCHEDULE

UNIT	ACTIVITY	HOURS	GROUPS	START	END
Topic 1. Introduction	Lectures	2	1	1st Week	1st Week
Topic 2. Documentation in management systems	Lectures	2	1	1st Week	2nd Week
	Seminars	1	2		
Topic 3. Quality control	Lectures	17	1	2nd Week	5th Week
	Seminars	8	2		
Topic 4. Management Systems	Lectures	13	1	5th Week	8th Week
Topic 5. Prevention of occupational risks	Lectures	2	1	9th Week	9th Week
	Seminars	1	2		
Topic 6. Audits	Lectures	4	1	10th Week	11th Week
Scheduled tutorials	Tutorials	4	2	Weeks 2, 5, 8 and 10	

* Scheduled tutorials and seminars are subject to possible modifications according to the joint course planning.



SUMMARY OF ACTIVITIES

TEACHING ACTIVITY	ASSOCIATED COMPETENCES	TEACHING ACTIVITY	STUDENT ACTIVITY	EVALUATION	P	NP	TOTAL	C
Lectures	CG7, CE16-SPQ8, CE16-SPQ10, CE16-SPQ11	Exposition of theoretical concepts.	Taking notes.	Qualification of the written answers to questions related to the theoretical concepts explained.	40	60	100	
Seminars	CE16-SPQ9, CT2-TQ1, CT8-TQ1	Application of theory to the resolution of exercises and problems.	Taking notes. Performing exercises. Formulation of questions and doubts.	Qualification of the answers (approach and result) made in writing for the resolution of practical exercises and numerical problems.	10	15	25	25%
Tutorials	CG6, CT1-TQ1, CT4-TQ1, CT5-TQ1, CT5-TQ2, CT8-TQ1, CT12-TQ1	Develop sensitivity to the social and environmental repercussions of engineering solutions. Correct and evaluate the work done by the student	Consult the teacher about the conceptual and methodological difficulties encountered when studying the subject. Preparation of group work proposed by the teacher (report and presentation with computer)	Work evaluation	4	6	10	25%
Exams	CT1-TQ1, CT11-TQ1	Propose, supervise and correct the exam. Grade the student	Preparation and realization		3	12	15	50%

P: In-class activities

NP: Non-classroom activities (self-study)

C: Assessment weighting