

Degree programme	Type	Course
Nanoscience and Nanotechnology	OP	4

Contact lecturer

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Prerequisites

There is no specific prerequisite. It is assumed that the students has the basic training of the first three years of the Degree in Chemistry.

Group languages

You can consult this information at the [end](#) of the document.

Objectives

The objective of the subject is to introduce the student to the concept of quality as a strategic resource for competitiveness and to provide the necessary tools to develop the laboratory's activity in the framework of a quality system based on the standards and current regulations.

As specific goals, we can emphasize:

- Define the basic principles that regulate the quality standards in laboratories, as well as the tools for their application
- Introduce to the student other tools related to quality, such as certified reference materials, document writing, good laboratory practices, etc.
- Apply concepts and statistical tools in specific cases, intercomparison exercises, methods validation, control graphics, etc.
- Know the importance of the validation of methods and their protocols
- Acquire the basic concepts of accreditation and the accreditation and certification procedures of the laboratories

Learning outcomes

- KM55 (Describe the steps necessary to establish a quality certification system.) Describe the steps necessary to establish a quality certification system.
- SM46 (Validate the quality assurance of a simple case using current norms, regulations and standards.) Validate the quality assurance of a simple case using current norms, regulations and standards.
- SM47 (Recognise quality systems based on standards and norms as a strategic resource for competitiveness.) Recognise quality systems based on standards and norms as a strategic resource for competitiveness.

Contents

SUBJECT 1. Basic aspects of quality assurance

Lesson 1. Introduction to quality: Evolution of the concept of quality. Basic components of quality. Implementation of quality systems.

Lesson 2. Regulatory references of quality systems: Normalization and normalization bodies. Certification and accreditation. Introduction to the Standards, Institutions and related Organisms. Generic systems for quality management.

Lesson 3. Introduction to ISO 9001 and ISO / IEC 17025. General principles. Description. Types of documents used in the quality system. Risk analysis concept.

Lesson 4. Introduction to Good Laboratory Practices. Scope. General principles. Description. Documentation. Differences with ISO standards.

Lesson 5. Quality audits: Audits in a quality system. Planning and conducting audits. Documentation.

SUBJECT 2. Metrological tools.

Lesson 6. Quality in the laboratory: Metrology in chemistry. The quality in the analytical process. Traceability as a basis for analytical quality. Uncertainty in the measurement and analytical results.

Lesson 7. Statistical tools used in quality: Basic concepts and statistical tools: sample and population. Significance tests. Comparison of two sets of results. ANOVA. Calculation of the uncertainty of an analytical method. Expression of results.

Lesson 8. Quality in basic laboratory work: Materials: mass measurement and volume. Reagents: qualities. Basic and chemical patterns. Certified reference materials.

SUBJECT 3. Activities for quality.

Lesson 9. Sampling and sample management: Sample type. Sampling error and its decrease. Sampling methods. Management of samples.

Lesson 10. Validation of analytical methods: Concept and type of validation. Quality parameters. Application guides (ICH) R3.

Lesson 11. Internal quality control: Control activities. Control graphics (Shewart and accumulated sums). Practical aspects of internal quality control.

Lesson 12. Intercomparison exercises: Quality evaluation. Definition and type of intercolaboration exercises. Tests of aptitude. Collaborative and certification exercises.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Self-learning	11	0.44	KM55, SM46, SM47
Independent study	60	2.4	KM55, SM46, SM47
Practical exercises classes	10	0.4	KM55, SM46, SM47
Theory classes	34	1.36	KM55, SM46, SM47

There are two types of teaching methodology in this subject, face-to-face and self-learning activities.

Face-to-face activity:

- Classes in the classroom: they will consist of the presentation of the main theoretical concepts that make up the subjects that are the object of the study.
- Exercises in the classroom: Students will have a collection of exercises and / or practical cases proposed by the teacher that will be resolved in the classroom.
- Seminars: Practical aspects derived from the introduction of a system of quality assurance in laboratories by experts in the subject that work in an industry will be discussed in the classroom. Specific cases to be resolved by means of spreadsheets (so that the student has contact with the management and data control systems) will be also considered.

The material presented to the theory classes and the exercises will be available to the students in Moodle in advance enough before each subject.

Self-learning activity:

- Preparation and delivery of specific numerical cases and practical cases, both individually and in groups, proposed by the teacher. This activity will be considered in the student's evaluation.
- If the number of students allows it, preparation and defense of a specific case on quality assurance / validation. Evaluable section.

Class transparencies are in English (mostly) and Spanish. The exams and works can be done in English, Catalan or Spanish.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of a class will be reserved, within the calendar established by the center/degree, for students to complete the surveys to evaluate the performance of the teaching staff and to evaluate the subject.

Annotation: within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
First partial exam	37,5	3	0.12	KM55, SM46, SM47
Seminars or conferences in the classroom	5	3	0.12	KM55, SM46, SM47
Group tasks	20	19	0.76	KM55, SM46, SM47
Second partial exam	37,5	3	0.12	KM55, SM46, SM47

Regarding the use of artificial intelligence tools, this subject is governed by the UAB Model 3:

Model 3 - Permitted use: "In this subject, the use of Artificial Intelligence (AI) technologies is permitted as an integral part of the development of the work, provided that the final result reflects a significant contribution by the student in the analysis and personal reflection. The student must clearly identify which parts have been generated with this technology, specify the tools used and include a critical reflection on how these have influenced the process and the final result of the activity. The lack of transparency in the use of AI will be considered a lack of academic honesty and may lead to a penalty in the grade of the activity, or greater sanctions in serious cases."

The performance of any irregularity in an assessment act (academic fraud, plagiarism or improper use of AI, unless such use is expressly authorized in the teaching guide), which may lead to a significant variation in the qualification, assumes that this act will be graded with a 0. In the event that the teaching guide foresees that to pass the subject it is an essential requirement to have obtained a minimum grade in this assessment act or that several irregularities occur in the assessment acts of the same subject, the final grade of this subject is 0. Apart from this, a disciplinary process may be instituted against the student who incurs any of these irregularities.

CONTINUOUS EVALUATION

The evaluation of the subject will be carried out through a continuous evaluation that will consist of:

- 1) Presentation of works that will be carried out individually or in previously defined groups. Sending files via Moodle. The submission of the works is mandatory. The works must be approved with a minimum grade of 5.0 out of 10 for them to be weighted in the final grade. The average grade of the works will be 20% of the final grade.
- 2) Presentation of an oral summary of each conference or seminar given. This summary will be presented individually by sending a video file via Moodle. Each summary must be approved with a minimum grade of 5.0 out of 10 for them to be weighted in the final grade. The average grade of the oral summaries will be 5% of the final grade. Attendance at the seminars or conferences and the submission of the summaries are mandatory. If for any reason they could not be carried out, their weighting in the evaluation would be distributed equally to the other items.
- 3a) Two partial exams that will evaluate theory and problems. The two partial exams will evaluate approximately two halves of the syllabus. Both partial exams must be passed (each with a minimum grade of 5.0 out of 10) to be considered for the final grade, otherwise each failed partial exam will be replaced by a make-up exam. The grade for each partial exam will be 37.5% of the final grade.
- 3b) A make-up exam that will evaluate theory and problems for the part of the syllabus corresponding to the failed partial exam. This make-up exam replaces the failed partial exam and is not intended to increase the grade when the partial exam is passed. Taking the make-up exam will invalidate the grade for the failed partial exam. A minimum grade of 5.0 out of 10 must be obtained in the make-up exam to be considered for the final grade, otherwise the subject will be failed. The grade for the make-up exam will be 37.5% of each failed partial exam. Only the grade for failed exams can be recovered. The grades and weights of failed written or oral assignments are not recovered.

To pass the subject, a minimum final grade of 5.0 points out of 10 must be obtained in the weighted sum of each part (20% assignments, 5% oral summaries, 2 x 37.5% midterm exams).

If the written assignments or oral summaries of the conferences and seminars are not submitted, the student will be classified as "not assessable", regardless of the grade of the midterm exams.

To participate in recovery, students must have previously been assessed in a set of activities whose weight is equivalent to a minimum of two-thirds of the total grade of the subject.

Students who do not pass the subject because they do not pass one or more parts (assignments, oral summaries, and/or exams), regardless of their overall average, will obtain a maximum final grade of 4.5.

SINGLE EVALUATION

Students who take part in the single evaluation must do the following:

1) Presentation of assignments that do not require in-person attendance. Sending files via Moodle. Submission of assignments is mandatory. Assignments must be approved with a minimum grade of 5.0 out of 10 for them to be considered in the final grade. The average grade of the assignments will be 20% of the final grade.

2) Presentation of an oral summary of each lecture or seminar given, which does not require in-person attendance. This summary will be presented individually by sending a video file via Moodle. Each summary must be approved with a minimum grade of 5.0 out of 10 for them to be considered in the final grade. The average grade of the oral summaries will be 5% of the final grade. If for any reason they cannot be carried out, their weighting in the evaluation would be distributed equally to the other items.

3a) A single exam that will evaluate theory and problems from the entire syllabus. The day of the single exam coincides with the date of the second partial exam. The single exam must be passed (minimum grade of 5.0 out of 10) for it to count towards the final grade, otherwise it will be replaced by a retake exam. The grade of the single exam will be 75% of the final grade.

3b) A retake exam that will evaluate theory and problems from the entire syllabus. This retake replaces the failed single exam and is not intended to increase the grade when the single exam is passed. Taking the retake will invalidate the grade of the failed single exam. The day of the retake exam is the same date as the continuous assessment retake exam. A minimum grade of 5.0 out of 10 must be obtained in the retake exam to count towards the final grade, otherwise the subject will be failed. The grade of the retake exam will be 75% of the final grade. Only the grade of the failed exam can be recovered. The grades and weights of failed written or oral assignments are not recovered.

To pass the subject, a minimum final grade of 5.0 points out of 10 must be obtained in the weighted sum of each part (20% assignments, 5% oral summaries, 75% single exam).

If the written assignments or oral summaries of the conferences and seminars are not submitted, the student will be classified as "not assessable", regardless of the grade of the partial exams.

To participate in recovery, students must have previously been assessed in a set of activities whose weight is equivalent to a minimum of two-thirds of the total grade of the subject.

Students who do not pass the subject because they do not pass one or more parts (assignments, oral summaries, and/or exams), regardless of their overall average, will obtain a maximum final grade of 4.5.

Bibliography

Although it does not follow the order of the program and the regulations referred to are not the current ones, it can be considered a textbook with the basic content of the subject: R. Compañó Beltrán, A. Ríos Castro; *Garantía de la calidad en los Laboratorios analíticos*. Editorial Síntesis. Madrid (2002).

Review and update of a classic textbook on the subject. The UAB has the electronic version of the book that is free to access: E. Prichard, V. Barwick; *Quality assurance in analytical chemistry*. Wiley (2007).

General statistics text; It is simple, convenient and practical: James Miller, Jane C Miller and Robert D. Miller; *Statistics and Chemometrics for Analytical Chemistry*, 7th Ed, Pearson Higher Education (2018).

A book about statistical tools applied to quality. (There is an e-book of 2012): P. Konieczka, J. Namieśnik; *Quality assurance and quality control in the analytical chemical laboratory: A practical approach*. CRC Press, Boca Ratón (2009). Un libro sobre las herramientas estadísticas aplicadas a la calidad. (Existe una edición e-book del 2012).

Tools for the use in statistical tests, linear regression, validation of methods, control charts, interlaboratory exercises, etc. There is an electronic version available at the UAB: M. Reichenbacher, J.W. Einax; *Challenges in Analytical Quality Assurance*. Springer (2011).

Software

Microsoft Excel

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this [link](#). To access the information, you will need to enter the course CODE