Academic Year/course: 2023/24

60650 - Metrology in the Chemistry Laboratory

Syllabus Information

Academic year: 2023/24
Subject: 60650 - Metrology in the Chemistry Laboratory
Faculty / School: 100 - Facultad de Ciencias
Degree: 540 - Master's in Industrial Chemistry
ECTS: 3.0
Year: 1
Semester: Second semester
Subject type: Optional
Module:

1. General information

The subject aims to provide a practical view of the measurement processes in chemistry, based on the understanding of the basic principles of measurement quality. It is structured in an introductory unit where the basic metrological concepts are defined and marked (traceability, accuracy and precision), a second unit on the measurement and propagation of uncertainties and statistically based decision making, a third one on the calculation of uncertainties in chemical measurement processes (mass, volume, general analytical methods), and a last one in which calibration and validation of methods are presented. The content is quite important for any task performed with quality control and measurement.

This subject is essential for statistically based decision making and for acquiring the necessary information on chemical systems. From this point of view, it contributes to SDG 2 (food security, nutrition, sustainable agriculture), 3 (healthy living), 8 (sustained economic growth), 9 (innovation) and 13 (taking action on climate change).

2. Learning results

Upon completion of this subject, the student will be able to:

Know the nature of the essential concepts of quality of measurement systems (traceability, accuracy and uncertainty) of a chemical nature and interpret them in the context of industrial or environmental problem solving.

Know and apply the different tests necessary to assess the quality of the results of measurement processes.

Analyse, step by step, the measurement processes in chemistry, determining the contribution to the uncertainty and accuracy of the result of each methodological step.

Calibrate and diagnose the condition of balances, volumetric equipment and other simple measuring systems.

Design, implement and assess the most appropriate calibration system.

Design a system for the validation and quality control of the measurement system´s results that is consistent with the quality requirements of the information needed.

Make decisions based on inferential statistics according to the data obtained and to their quality characteristics.

3. Syllabus

1. Fundamental concepts of chemical metrology: techniques, methods, measurement systems and traceability.

2. Statistical basis for uncertainty estimation.

3. Propagation and combination of uncertainties.

4. Significance tests.

5. Accuracy and uncertainty in mass measurement.

6. Accuracy and uncertainty in the measurement of volumes.

7. Bottom up" calculation of the uncertainty of analytical results according to Eurachem.

8. Linear calibration of analytical methods

9. Validation and quality control of analytical systems.

4. Academic activities

The student´s learning is based fundamentally on the solving of problems and cases, but there must also be theory sessions

that help the student understand and solve them. The subject is therefore arranged as follows:

1.- 15h of participative lectures (1,5 ECTS).

2.- 15h of problem/case classes. Both numerical problems and practical cases will be presented and solved (1.5 ECTS).

5. Assessment system

The student must demonstrate achievement of the intended learning results through the following assessment activities:

Progressive assessment of the learning process through the solving of problems, case studies and test questions distributed throughout the teaching period -typically one deliverable every 2 weeks- (grade 1).

Optionally, a practical written test may be taken during the official exams call corresponding to the global assessment periods (grade 2). This test will consist of the solving of numerical case studies similar to those used in the continuous assessment.

The **final grade** may be obtained according to the following criteria:

i) Considering progressive assessment:

Final grade= grade 1

ii) Considering only the test grades of the global assessment periods:

Final grade= grade2

To pass, the grade must be equal to or higher than 5.