

29939 - Instrumental Analysis for Quality Control in the Industry

Syllabus Information

Academic year: 2023/24

Subject: 29939 - Instrumental Analysis for Quality Control in the Industry

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 435 - Bachelor's Degree in Chemical Engineering

ECTS: 6.0

Year: 4

Semester: Second semester

Subject type: Optional

Module:

1. General information

The aim is for the student to acquire the essential knowledge and skills that guarantee quality in the industry chemistry. To this end, the basic principles of quality (quality management systems; manuals, standards and procedures) and those corresponding to quality control applied in chemical facilities will be addressed, including the analytical process, the basis of instrumental techniques and the use of process analyzers as a basis for quality assurance.

These approaches and goals are aligned with the following Sustainable Development Goals (SDGs) of the United Nations Agenda 2030 (<https://www.un.org/sustainabledevelopment/es/>), so that the acquisition of the learning results of the subject provides training and competence to contribute, to some extent, to the achievement of the Objective 9.4 of Goal 9. It will also, and to a lesser extent, contribute to the achievement of objective 2.4 of goal 2, objective 3.9 of goal 3, objective 6.3 of goal 6, objective 9.4 of goal 9, and objective 12.4 and 12.5 of goal 12.

2. Learning results

- Acquire the basic skills for the execution and assessment of the quality of analytical methods and their application to industrial process control.
- Be able to adequately apply the theoretical concepts in the development of chemical processes in the laboratory.
- Be able to plan a quality management system.
- Differentiate and select the most appropriate chemical process analyzer for the chemical process under study.
- Use rigorous language in chemistry.
- Present and interpret data and results.
- Teamwork.

3. Syllabus

Master classes: 15 hours

- Unit 1. Introduction (1 h)
- Unit 2. Quality management system: manuals, norms and procedures (2 h)
- Unit 3. Electrical methods for quality control: ion selective electrodes (1 h)
- Unit 4. Optical methods for quality control: molecular and atomic spectrophotometry (5 h)
- Unit 5. Chromatographic methods for quality control: liquid and gas chromatography (5 h)
- Unit 6. Automatic systems for quality control (1 h)

Laboratory practices: 45 hours

- Session 1. Search for information: Internet search engines. ISO and UNE Standards (4 h)
- Session 2. Computer tools for quality control: Chemometrics (4 h)
- Session 3. Elaboration of analysis procedures (4 h)
- Session 4. Individual presentation and choice of procedures to be carried out in the laboratory (3 h)
- Session 5. Characterization of solids (4 h)
- Session 6. Quality control in the oil industry (4 h)
- Session 7. Quality control in the metalworking industry (4 h)
- Session 8. Quality control in the food industry (4 h)
- Session 9. Quality Control in the Pharmaceutical Industry (4 h)
- Session 10. Quality control and contaminant analysis (4 h)
- Session 11. Quality control of finished product (4 h)
- Session 12. Exhibition of works (2 h)

For the development of the practical sessions, each student will be assigned an analytical determination; tutored by the

responsible teacher, they will have to look for the necessary information (sessions 1 to 3) for the approach and development of the practical. After the sharing (session 4), both students and teachers will choose the determinations to be performed at the laboratory (sessions 5 to 11); these will be carried out in small groups. At the end, each working group should present the goal, the methodology used, relevant results and conclusions (session 12).

4. Academic activities

Lectures (15 hours) where the theory of the different topics that have been proposed will be taught and model cases will be solved model.

Practical classes (45 hours) in which the theoretical knowledge learned will be applied to real industry cases.

Personal study and work (85 hours). It is recommended that students carry out individual study on a continuous basis throughout the four-month period..

Assessment tests (5 hours). There will be a global test where the theoretical and practical knowledge achieved by the student will be assessed.

5. Assessment system

It is recommended that the student follow a **continuous assessment**. To this end, the following will be carried out:

- **Theoretical tests.** During the term, and during class time, three tests (multiple-choice test in where incorrect answers will be penalized as $1/(N-1)$, being N the number of possible answers) will be carried out to evaluate the theoretical part (**25%** of the total grade of the subject). The weight of each of these tests is proportional to the subject matter assessed (number of hours taught): 20% - 40% - 40%.
- **Continuous monitoring** of laboratory work: It will account for **35%** of the grade for the subject and is based on the observation of individual work in the laboratory, including parameters such as previous preparation of the work to be done, aptitude, attitude, punctuality..
- **Assessment of the reports:** It will represent **40%** of the grade of the subject and it will assess the experimental results and the results calculated during the work in the practical sessions, as well as the different presentations (individual and group) to be made by the students.

Students who have not passed the subject through continuous assessment, or who have not opted for this assessment system, and for those who wish to improve their grade, may opt for the global evaluation system **100%** of the subject, there are two exams: theory (multiple-choice) and practical (laboratory), whose weights (25% and 75%, respectively) coincide (25% and 75%, respectively) coincide with the distribution of ECTS credits and whose grade will be analogous to the one proposed in the continuous assessment.