

60643 - Process and Product Control

Syllabus Information

Academic year: 2023/24

Subject: 60643 - Process and Product Control

Faculty / School: 100 - Facultad de Ciencias

Degree: 540 - Master's in Industrial Chemistry

ECTS: 6.0

Year: 1

Semester: First semester

Subject type: Compulsory

Module:

1. General information

The subject "**Process and Product Control**" is a compulsory subject of the Master's Degree in Industrial Chemistry taught by teacher from the analytical chemistry area, which broadens and deepens the knowledge of the Degree in Chemistry related to industrial process control. The student acquires competences to select and use analytical methodology to solve real problems or for characterization techniques related to the control of processes and products in the industry.

These approaches and objectives are aligned with the following **Sustainable Development Goals (SDGs)** of the United Nations Agenda 2030(<https://www.un.org/sustainabledevelopment/es/>) in such a way that the acquisition of the learning results of the subject provides training and competence to contribute to some extent to their achievement:

Objective 4: Quality education.

Objective 6: Clean water and sanitation.

Goal 7: Affordable and non-polluting energy.

Objective 9: Industry, innovation and infrastructure

2. Learning results

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

- Know and apply procedures for the control of processes and products on an industrial scale.
- Use the appropriate terminology on concepts related to process and product control: control loops, automation, process analysers, physical sensors, chemical sensors, biosensors.
- Know the most suitable instrumental analytical techniques, biosensors and process analysers for the different applications of process control in the chemical industry.
- Identify and define the main elements of real industrial problems in order to propose the most appropriate analytical techniques and control elements to solve them.
- Design the analytical methodology according to the different applications of process control in the chemical, biotechnological and food industries, or in industries related to the biomedical, clinical and environmental fields.
- Manage, distinguish and select the most appropriate sources of scientific information.
- Use scientific English, both to obtain information and to transfer knowledge.
- Summarize and communicate scientific findings and knowledge to specialized and non-specialized audiences.

3. Syllabus

INDUSTRIAL PROCESS CONTROL

Introduction, concepts and terminology. Control loops. Instrumentation. Automation.

2. ANALYTICAL CONTROL OF OFF-LINE PROCESSES

Levels of automation. Laboratory analysers. Automatic instrumental titrators.

3. INDUSTRIAL ANALYZERS BASED ON SPECTROMETRIC TECHNIQUES.

Analysers based on molecular techniques, UV-vis absorption, near infrared (NIR), mid-infrared, Raman spectrometry. Analysers based on atomic techniques: neutron activation and X-ray fluorescence.

4. INDUSTRIAL ANALYZERS BASED ON ELECTROANALYTICAL AND CHROMATOGRAPHIC TECHNIQUES.

Conductimetry, potentiometry and voltammetry. Exclusion and ion chromatography. Gas chromatography.

5. SENSORS AND BIOSENSORS IN THE CONTROL OF INDUSTRIAL AND BIOTECHNOLOGICAL PROCESSES.

Sensors for physical and chemical parameters. Actuators. Biosensors. Types of transduction. Lateral flow, acoustic, SPR, enzymatic and *biochip* biosensors.

6. APPLICATIONS OF ANALYTICAL CHEMISTRY IN INDUSTRIAL PROCESS CONTROL.

Examples of process control in the chemical, food, pharmaceutical and biotechnology industries. Emerging trends and areas.

4. Academic activities

Teaching-learning tasks (6 ECTS):

- **TP1 type activities**(30 h.): lectures that complete the theoretical program of the subject.
- **TP2 type activities**(20 h.): study of problems and real cases of control in manufacturing processes in the chemical industry.
- TP6 type activities**(5 h.): small groups will work on a specialized topic on the contents of the subject. The activity includes the search and reading of bibliographic information, writing of a report, preparation of a summary presentation with the most essential information and public presentation. Personalized tutoring with the teacher will be provided.
- **Assessment controls**(5 h.): set of continuous assessment controls both written and oral.
- Visits to companies**(5 h.).
- Student's autonomous work**(85 h.): study of the subject's topics and completion of assignments and reports.

5. Assessment system

The student must demonstrate that they has achieved the expected learning results through the following **assessment activities**:

CONTINUOUS ASSESSMENT

There will be exams on the different topics of the subject, whose grades will be averaged provided that, individually, they are higher than 4 out of 10. If the student passes these exams, along with the rest of the activities in the indicated percentage, they will not need to write the global assessment exam. The percentages of the assessment of the subject's topics will be:

Assessment controls: **70%**

Group work (TP6 activity):**15%**

Problem solving and case studies:**15%**

The completion of the **group work** (activity TP6) will be mandatory to pass the subject.

GLOBAL ASSESSMENT

Students who do not opt for continuous assessment who do not pass the subject by this procedure, or who want to improve their grade, must take a **global test** of the subject in the first or second call. This global test will account for 100% of the grade, and it will cover all the activities of the subject on the dates provided by the examination calendar of the Faculty of Sciences.