Experimentation in Chemical Engineering I

Code: 106055
ECTS Credits: 6

2024/2025

Degree	Type	Year
2500897 Chemical Engineering	OB	3

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Teachers

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

To have completed the subjects of: Statistics; Maths; Bases of Experimentation in Chemical Engineering; Basics of Chemical Engineering; Computer Applications; Differential Equations and Vector Calculus; Chemical Kinetics; Circulation of Fluids; Heat Transmission and Thermotechnics; Applied Thermodynamics; Control, Instrumentation and Automation; Separation Operations; reactors

Objectives and Contextualisation

Topply the scientific method to systems in which chemical and physical transformations take place both on a microscopic and macroscopic scale. Design experiments.
To write reports of experimental work carried out in the laboratory, effectively communicating in written form, the knowledge, the results and their analysis and the conclusions related to the field of the chemical laboratory and chemical engineering.
To familiarize yourself with experimental techniques and setups. Analyze, evaluate, design and operate systems or processes, equipment and facilities of chemical engineering according to certain requirements, standards and specifications under the principles of sustainable development.
To consolidate theoretical foundations acquired in previously studied subjects. Understand and apply the basic principles on which chemical engineering is based, and more specifically: material, energy and momentum balances; equilibrium between phases and chemical equilibrium; kinetics of the processes of transfer of matter, energy and amount of movement, and kinetics of the chemical reaction. Put into practice the fundamental laws of thermodynamics.

To demonstrate an understanding of the main concepts of chemical engineering process control. Apply in the field of chemical engineering the scientific and technological foundations of automation and control methods. To acquire, process, treat and correlate experimental data using the appropriate tools. Critically analyze the results. Apply the concepts of rounding error, sensitivity analysis, significant figures and error propagation. Gather and interpret relevant data to make judgments that include a reflection on prominent issues of a social, scientific or ethical nature. Carry out a critical analysis of the experimental results and the global work carried out.
To assume the values of responsibility and professional ethics typical of chemical engineering.
To develop critical thinking and reasoning
To work autonomously.
To prevent and solve teamwork problems respecting the diversity and plurality of ideas, people and situations.
To maintain a proactive and dynamic attitude regarding the development of one's own professional career, personal growth and continuous training. Have a spirit of improvement.

Competences

- Analyse, evaluate, design and operate the systems or processes, equipment and installations used in chemical engineering in accordance with certain requirements, standards and specifications following the principles of sustainable development.
- Apply scientific method to systems in which chemical, physical or biological transformations are produced both on a microscopic and macroscopic scale.
- Assume the values of professional responsibility and ethics required in chemical engineering.
- Demonstrate understanding of the main concepts for controlling chemical engineering processes.
- Develop personal attitude.
- Develop personal work habits.
- Develop thinking habits.
- Observe ethics and professionalism.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
- Understand and apply the basic principles on which chemical engineering is founded, and more precisely: balances of matter, energy and thermodynamic momentum, phase equilibrium and kinetic chemical equilibrium of the physical processes of matter, energy and momentum transfer, and kinetics of chemical reactions
- Work in a team.

Learning Outcomes

1. Analyse, evaluate, design and implement homogenous reactors.
2. Apply the scientific and technological basics of automatisms and control methods to the field of chemical engineering.
3. Design experiments.
4. Develop critical thinking and reasoning
5. Maintain a proactive and dynamic attitude with regard to one's own professional career, personal growth and continuing education. Have the will to overcome difficulties.
6. Perform a critical analysis of experimental results and of the overall work done.
7. Practice the fundamental laws of thermodynamics.
8. Prevent and solve problems.
9. Respect diversity in ideas, people and situations.
10. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
11. Work autonomously.
12. Work cooperatively.

Content

A) Laboratory sessions (directed activity)
3-hour sessions, in laboratory Q6/0006. The presentation of the subject will take place on the first school day of the second semester and attendance is compulsory.
In these sessions, the following practices are carried out:
1.- Reactors.
2.- Determination of residence time in reactors.
3.- Feedback and cascade control.
4.- Control valves.
5.- Rectification.
6.- Heat exchangers.
7.- Heat transmission by convection
8.- Chemical kinetics.
9.- Determination of properties: Conductivity and thermal diffusivity
B) Practice reports (independent activity)
Elaboration of reports from the data obtained in the laboratory, analysis and discussion of the data obtained and comparison with the appropriate bibliography, calculation of the propagation of errors and/or sensitivity analysis. Elaboration of detailed calculation examples. Proposal of experiments

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Carrying out the experiments and consolidatidation of working habits in the laboratory and in handling the equipment	84	3.36	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Presentation of the lab experiments to be done and their operation. Distribution of groups and shifts.	3	0.12	4, 8, 11
Type: Supervised			
Completion of the exam	3	0.12	1, 2, 4, 5, 6, 7, 11
Type: Autonomous			
Preparation of reports o the experimental work carried out at the lab	50	2	3, 4, 5, 6, 8, 9, 10, 11, 12
Preparation of the global exam	10	0.4	3, 4, 5, 6, 10, 11

It is a compulsory the attendance to the subject due to its hands-on character in the laboratory.
Depending on the number of students, the academic calendar and the number of experimental facilities available, students will be divided into shifts, and each shift in work teams of 2-3 persons as maximum.
It is extremely important to follow the safety.
On the first day of work in the laboratory you must bring the document of conformity, once you have read the information related to "Safety in teaching laboratories" available in moodle of 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

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Attitude in the laboratory. Attendance, organization and time management. Cleaning and care of the work area, punctuality, following of safety regulations. (It will be calculated as: 50% peer assessment and 50% professors assessment).	20%	0	0	5, 8, 9, 11, 12
Final examination	30%	0	0	4, 5, 10, 11
Reports of performed experiments (in group)	50%	0	0	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

The specific details of the assessment of this subject can be found in the Catalan version of this document. If necessary, you can contact the faculty responsible for the subject.

Bibliography

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Software

MS Excel y MS Word
Matlab
Polymath
Labview
Taylor-made software for control of equipments

Language list

Name	Group	Language	Semester	Turn
(PLAB) Practical laboratories	211	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	212	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	213	Catalan/Spanish	second semester	morning-mixed