Universitat Autònoma de Barcelona

2021/2022

Experimentation in Chemical Engineering III

Code: 102394
ECTS Credits: 3

Degree	Type	Year	Semester
2500897 Chemical Engineering	OB	3	2

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Other comments on languages

This subject in entirely taught in Catalan and/or Spanish

Teachers

Eduardo Beltrán Flores
David Gabriel Buguña

External teachers

Laura Trigo
Àlex Baldirà

Prerequisites

To have completed the subjects: Balances in chemical engineering balances, separation operations, heat transfe

To be enrolled in the subject control and instrumentation. Level B2 (European reference framework) of Catalan o

Objectives and Contextualisation

- To put into practice concepts acquired in compulsory subjects of the Degree in Chemical Engineering such as: Mass and energy balances, separation operations, chemical reactors and control and instrumentation.
- To familiarize yourself with analytical techniques and experimental rigs.
- To consolidate the theoretical foundations acquired in the subjects previously studied.

- To apply the statistical analysis of experimental measures, including sensitivity analysis, significant figures and so.
- To acquire, to process, to analyse and to correlate experimental data using the appropriate tools. To critically assess the results obtained.
- To efficiently communicate,in written form, the knowledge, the results and their analysis and the conclusions related to experiments performed.

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 knowledge of the different reaction, separation and processing operations for materials, and transport and circulation of fluids involved in the industrial processes of 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.
- 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. Adapt to unforeseen situations.
2. Apply matter and energy balances to continuous and discontinuous systems.
3. Apply numerical methods to resolve empirical cases.
4. Apply temperature and level PID control.
5. Assume social, ethical, professional and legal responsibility, if applicable, derived from professional exercise.
6. Critically evaluate the work done.
7. Develop scientific thinking.
8. Generate innovative and competitive proposals in professional activity.
9. Identify, manage and resolve conflicts.
10. Manage information by critically incorporating the innovations of ones professional field and analyse future trends.
11. Operate common equipment used in the chemical industry.
12. Perform a critical analysis of experimental results and of the overall work done.
13. Perform experiments.
14. Perform separation operations.
15. Practice the fundamental laws of thermodynamics.

Content

The planned contents are as follows, but possible restrictions imposed by health authorities may require prioritiza

A) Laboratory sessions (supervised activity) 15 sessions of 3 hours, at laboratory Q6/0006.

The presentation of the subject will be held on the first day of the second semester and it is compulsory the assis

To determine the variation of the kinetic constant with the temperature. To analyse the reliability of applying theor

equations in an CSTR and PFR. 2.- Distribution of the residence time in reactors. To analyse the real behavior of

from the distribution of residence time (DTR) of each system.

3.- Control. To analyse of the response for both open and closed loop in two processes (temperature and level).

4.- Valves. To study the response of different control valves for different control signals and in different operating

To prepare the characteristic curves for each of the three valves available in the experimental rig.

5.- Heat exchangers with Aspen Exchanger Design and Rating (EDR).

Designing a heat exchanger of shell and tubes from the data obtained using the Kern method. To study of differe

6.- Rectification. Calculation of the number of plates from the column at total reflux. Checking the equations of Ra

Calculation of the necessary useful power. Calculation of the cooling water needs. Checking the mass balance.

B) Practical reports (autonomousactivity)

Preparation of lab reports based on the data obtained in the laboratory, analysis and discussion of thedata obtain

and comparison with the appropriate bibliography, calculation of the propagation of errors and/or sensitivity analy

Preparation of detailed calculation examples.

Methodology

The proposed teaching methodology may experience some modifications depending on the restrictions to face-to

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 nu

facilities available, students will be divided into shifts, up to a maximum of 3, and each shift in work teams, up to

of 10 groups per shift.
Safety measure should be followed all the time.

It is extremely important to follow the safety and hygiene rules arising from the exceptional situation of COVID-19

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.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Carrying out the experiments and consolidatidation of working habits in the laboratory and in handling the equipment	45	1.8	1, 4, 5, 6, 7, 13, 14, 8, 10, 9, 11, 15
Presentation of the lab experiments to be done and their operation. Distribution of groups and shifts.	3	0.12	1, 9
Type: Supervised			
Preparation and completion of the exam	4	0.16	
Type: Autonomous			

Preparation of practical reports	23	0.92	1, 2, 6, 7, 12, 9

Assessment

Student's assessment may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

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.

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	1, 2, 4, 3, 5, 6, 7, 13, 14, 12, 8, 10, 9, 11, 15
Final exam (individual)	30%	0	0	2, 3, 7, 12, 9
Reports of experiments performed (in group)	50%	0	0	1, 2, 3, 5, 6, 7, 12, 8, 10, 9, 15

Bibliography

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Electronic references

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Software

MS Excel y MS Word

Matlab

Polymath

Aspen Hysys

Labview

Armfield equipment software

Home-made software for control of equipments