Universitat Autònoma de Barcelona

2019/2020

Advanced Experimentation in Chemical Engineering

Code: 102399
ECTS Credits: 6

Degree	Type	Year	Semester
2500897 Chemical Engineering	OT	4	0

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

Prerequisites

Have studied or to be enrolled in Separation Units, Environmental Engineering, Material Resistance and Experimentation in Chemical Engineering III.

Objectives and Contextualisation

- To put into practice concepts acquired in subjects of the degree in chemical engineering, mainly in unit operations based on the mass transfer.
- Familiarize yourself with experimental techniques and assemblies, in particular with column operations.
- Analyze the behavior of some separation units based on the operational variables.
- Consolidate the theoretical foundamentals acquired on corrosion of metals.

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 basic knowledge of the use and programming of computers, and apply the applicable IT resources to 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 work habits.
- Develop thinking habits.
- Objectively compare and select different technical options for chemical processes.
- Observe ethics and professionalism.
- Show an understanding of the role of chemical engineering in the prevention and resolution of environmental and energy problems, in accordance with the principles of sustainable development.
- Work in a team.

Learning Outcomes

1. Adapt to multidisciplinary and international surroundings.
2. Apply PID control of temperature and level to chemical processes.
3. Apply computer simulation programs to chemical operations and plants.
4. Apply numerical methods to resolve empirical cases in chemical process engineering.
5. Apply the basics of chemical engineering to the treatment of urban and industrial solid waste and the obtainment of sources of renewable energy.
6. Assume social, ethical, professional and legal responsibility, if applicable, derived from professional exercise.
7. Calculate characteristic losses by friction in conduction of industrial processes.
8. Critically analyse the results of experiments and of the overall work done in characteristic chemical process engineering activities.
9. Design experiments applicable to chemical process engineering.
10. Develop a capacity for analysis, synthesis and prospection.
11. Develop independent learning strategies.
12. Identify, manage and resolve conflicts.
13. Make ones own decisions.
14. Monitor the advance of a chemical reaction using the most suitable methodology.
15. Objectively distinguish different alternatives in solid and industrial waste treatment plants and in the processes of obtaining renewable energies
16. Objectively select alternatives in consideration of performance parameters, selectivity and economic criteria.
17. Operate with common and specific equipment used in the chemical industry.
18. Perform advanced separation operations in the chemical process industry.
19. Properly perform chemical process engineering experiments.
20. Use measuring elements to determine properties of solids and fluids in chemical process engineering.
21. Work cooperatively.

Content

Block 1: Specific Practices in Chemical Process Engineering

- Absorption in continuous mode with and without reaction: energy losses through the filling, estimation of mass transfer coefficients.
- Refrigeration tower: study at the stationary state, approximation to the humid temperature according to the operating variables.
- Dye adsorption on active carbon: determination of the equilibrium isotherm and kinetic model fitting, pH effect.
- Study of the phenomenon coagulation-flocculation: determination of the optimum dose.
- Corrosion of metals, pH effect, different protection options.

Block 2:

Option A) Practices in pilot plant at AIGEP (Toulouse)

Pilot-level practices: unit transfer of mass and heat transfer, reactors.

Option B) Biochemistry Engineering Practices (UAB)

Practices of different processes characteristic of biochemical engineering.

Methodology

Guided activities:

Experimental planning of the practices and knowledge of the safety regulations.
Completion of laboratory practices in work groups:
Part A (3 ECTS) specific practices of the Chemical Process Engineering to be carried out in the laboratories of the Engineering School (UAB)
Part B (3 ECTS) laboratory practices and pilot plant separation operations characteristic of both Chemical Processes and Biochemical Eng.

Part B can be carried out both at the Atelier Interuniversitari de Génie des Procedes of the Paul Sabatier University in Toulouse and the UAB Engineering School.

Autonomous activities:

Planning the experiments of each practice must be carried out of the laboratory.
Analyze the results critically, extract conclusions and propose improvements.

Each working group will have to prepare and submit a written report of each practice carried out.

The attitude in the lab and the laboratory book will be evaluated.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Presentation, knowledge of the facilities and security measures	2	0.08	1, 5, 6, 15, 12, 14, 17, 21, 20
Realization of laboratory and pilot practices	88	3.52	2, 6, 7, 9, 19, 18, 14, 17, 20
Type: Autonomous			
Planning, result analysis and report writting	56	2.24	8, 3, 4, 7, 11, 10, 16, 14, 13

Assessment

a) Process and scheduled evaluation activities

The assessment will consist of 3 sections:

- Practical reports: elaboration and presentation of reports that include experimental planning, the results obtained and their critical analysis. The reports can be done by group of work in the laboratory (40% note).
- Final exam: written exam about the theoretical and experimental contents of the practices carried out (45% note). You must obtain a minimum mark of 4/10 to be able to pass the subject.
- Skills in the laboratory: Assessment of the attitude, compliance with labor standards in the laboratory, laboratory book (15% note).

Attendance to the programmed sessions of practice and the presentation of the reports are requisites to pass the subject.

b) Programming of evaluation activities

The practice sessions will be scheduled between weeks 4 and 14. There will be no practice shifts. Each group will do 4 practices of 2-3 sessions. Practices may not be carried out in a conscientious way.

The first delivery of the reports will be 2 weeks after the completion of the 2nd practice.

The second delivery of the reports will be 2 weeks after the completion of the practices.

The final test will be during week 17 and its recovery during week 20.

c) Evaluation process

It is necessary to have a minimum mark of 40% of the practice reports to be able to do the final exam.

The student will be able to repeat the exam if they have attended the first call.

d) Procedure for the review of qualifications

When the marks are published,the day, time and place of revision will be indicated in which the student will be able to review the activity with the professor.

e) Qualifications

A student will be considered non-evaluable if he has not done all the practices and / or has not delivered all the reports.

The regulations of the UAB indicate that Honor Grade can only be awarded to students who have obtained a final grade of 9.00 or more. It can be granted up to 5% of Honor Grade of the total number of students enrolled.

f) Irregularities by the student, copy and plagiarism

Without prejudice to other disciplinary measures considered appropriate, the irregularities committed by the student that can lead to a variation in the rating of an evaluation act will be qualified with a zero. Therefore, copying, plagiarizing, cheating, copying, etc. In any of the assessment activities it will imply suspending it with a zero. Assessment activities qualified in this way and by this procedure will not be recoverable. If it is necessary to pass any of these assessment activities to pass the subject, this subject will be suspended directly, without opportunity to recover it in the same course.

h) Evaluation of repeating students

Students who enroll for the 2nd time, if they have reports with a grade of more than 55%, the note will be saved.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Final exam	45 %	2	0.08	8, 10, 16, 13
Laboratory skills	15 %	0	0	1, 8, 2, 6, 11, 10, 9, 19, 18, 12, 14, 17, 13, 21, 20
Recovery the final exam	45 %	2	0.08	8, 10, 16, 13

Reports of the practices	40 %	0	0	5, 3, 4, 7, 11, 10, 15, 16, 12, 14, 17, 13, 21, 20

Bibliography

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William D. Callister. *Introducción a la Ciencia e Ingeniería de los Materiales* vol II, cap 18, Editorial Reverté. (1996)

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