

Degree programme	Type	Course
Chemical Engineering	OB	3

Contact lecturer

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Teaching staff

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Group languages

You can consult this information at the [end](#) of the document.

Prerequisites

Having assisted to Termodinàmica Aplicada

Objectives

The main objective of the subject is that the student learns to select, analyze and design different separation operations controlled by the mass transfer and the heat transmission

The specific objectives of the subject are :

- Understand the different separation operations, their modes of operation and possible applications.
- Understand the physical concepts and fundamentals of each operation studied.
- Use common and illustrative methods of calculation of separation systems
- Design the most common separation equipment

Learning outcomes

1. Conceive and evaluate alternatives and perform design and operation calculations in binary and multicomponent mixture separation processes.
2. Apply and identify basic concepts related with chemical engineering.
3. Apply the scientific and technological basics of matter transfer to separation operations.
4. Choose between different options for defining separation processes.

5. Develop a capacity for analysis, synthesis and prospection.
6. Develop scientific thinking.
7. Work autonomously.
8. Manage available time and resources. Work in an organised manner.
9. Prevent and solve problems.
10. Make one's own decisions.
11. Develop curiosity and creativity.
12. Adapt to unforeseen situations.
13. Critically evaluate the work done.
14. Generalise the concepts of the analysis and design of separation operations to apply them to different operations in the process industry.
15. Use waste and energy consumption minimisation criteria in the design of separation operations.

Contents

- 1.- Introduction. Classification of separation operations. Equilibrium between phases
- 2.- Flash distillation
 - 2.1.- Binary mixtures. Calculation methods
 - 2.2.- Multi-component mixtures. Calculation methods.
 - 2.3.- Flash distillation equipment.
- 3.- Rectification
 - 3.1.- Operation in multiple stages.
 - 3.2.- General concepts. Mass and energy balances.
 - 3.3.- Rectification of binary mixtures
 - 3.3.1.- Lewis Method (McCabe-Thiele Method)
 - 3.3.3.- Sorel method
 - 3.4.- Efficiencies of stage and overall efficiency.
 - 3.5.- Correction of multicomponent mixes
 - 3.5.1.- Rapid ("short-cut") methods
 - 3.5.2.-Rigorous methods.
 - 3.6.- Distillation of azeotropic mixtures.
- 4.- Discontinuous distillation
 - 4.1.- Discontinuous simple distillation
 - 4.2.- Discontinuous rectification. Modes of operation.
- 5.-Design of columns
 - 5.1.- Design of plate columns.
 - 5.2.- Design of packed columns

6.-Absorption

6.1.- General concepts of absorption and stripping

6.2.- Absorption and stripping of a component

6.3.- Multi-component absorption and stripping

7.- Liquid-liquid extraction of immiscible mixtures

7.1.- Extraction equipment.

7.2.- Application of the methods of McCabe and Kremser.

7.3.- Liquid-liquid extraction of miscible mixtures

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Packed columns	10	0.4	1, 3, 5, 9
Flash distillation	10	0.4	1, 5, 6, 9
Study	28	1.12	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
Absorption	12	0.48	1, 3, 4, 5, 9
Liquid-liquid extraction	14	0.56	1, 3, 5, 6, 9
Exercise	7	0.28	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
Batch distillation	12	0.48	1, 3, 5, 6, 9, 10
Binary rectification	12	0.48	1, 3, 5, 6, 8, 9, 10
Equilibrium stages	5	0.2	3, 4, 5, 6
Multicomponent distillation	18	0.72	1, 3, 4, 5, 6, 9, 10

During the course there will be master classes where the concepts of subject topics will be introduced. In each topic, the examples of calculation or design will be introduced and problems will be given for home work. One exercise will be carried out at home which will be scored.

Communications with students will be carried out through the Moodle Classroom on the Virtual Campus.

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

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Exercise	15	8	0.32	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
Test 1: Flash, binary distillation, multicomponent distillation and discontinuous distillation	45	7	0.28	1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 13, 14, 15
Test 2: Absorption and column design; liquid-liquid extraction	40	7	0.28	1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 13, 14, 15

Assessment

Assessment for this course will be based on the following activities:

- Completion of one exercise: 15% of the final grade.
- First midterm exam: 45% of the final grade.
- Second midterm exam: 40% of the final grade.

To calculate the final grade using the weighted average of the assessment activities, students must obtain a minimum grade of 4.0 out of 10 in each of the two midterm exams.

The course will be considered passed when the final grade is 5.0 out of 10 or higher, provided that a minimum grade of 4.0 out of 10 has been obtained in each of the two midterm exams, either in the ordinary assessment period or, where applicable, after the resit examination.

Students who do not pass the course through continuous assessment may take a resit examination.

The resit examination will include one exercise corresponding to each of the two midterm exams to be retaken. Each student will only be required to retake the midterm exam(s) in which they obtained a grade below 4.0.

- If only one midterm exam is retaken, the new grade will replace the original grade for that exam, while the grade for the other midterm exam and the exercise (15%) will remain unchanged.
- If both midterm exams are retaken, the resit examination will account for 85% of the final course grade (45% + 40%). In all cases, the grade for the exercise (15%) will remain unchanged and cannot be retaken.

A student will receive a Not Assessable (NA) grade if they have not participated in assessment activities accounting for at least 15% of the final course grade.

For each assessment activity, the date, time, and place of the review session will be announced. During this session, students may review their work with the course instructors and, where appropriate, submit appeals regarding their grades. Students who do not attend the review session will not be entitled to a subsequent review.

Honors Distinction

The awarding of the Honors Distinction (Matrícula de Honor) is at the discretion of the instructors responsible for the course. In accordance with UAB regulations, it may only be awarded to students who obtain a final grade of 9.0 or higher. The number of Honors Distinctions awarded may not exceed 5% of the enrolled students.

Academic Integrity and the Use of Artificial Intelligence

The use of Artificial Intelligence (AI) technologies is not permitted at any stage of the assessment activities in this course. Any assignment containing AI-generated content will be considered a breach of academic integrity and may result in a partial or total reduction of the grade for the assessment activity, or more severe disciplinary measures in serious cases.

Any irregularity committed during an assessment activity (academic fraud, plagiarism, unauthorized use of AI, or any other action that may significantly affect the assessment outcome) will result in a grade of 0 for the corresponding assessment activity.

Since obtaining a minimum grade of 4.0 out of 10 in each of the two midterm exams is a mandatory requirement to pass the course, any irregularity in either midterm exam will result in a final course grade of 0. Likewise, the final course grade will also be 0 if multiple irregularities occur in the assessment activities of the course.

Without prejudice to these academic consequences, the University may initiate the appropriate disciplinary proceedings against students who commit any of these irregularities, in accordance with the applicable regulations.

Other Considerations

No differentiated assessment system is *предусмотрен* for students repeating the course.

This course does not offer a single-assessment option.

Bibliography

- Wankat Ph.C. "Separation Process Engineering". 2nd ed. Prentice-Hall (2007)
- Wankat Ph.C. "Separations in Chemical Engineering: Staged Operations". Elsevier, N.Y. (1988).
- King C.J. "Procesos de separación". Reverté, BCN (1980)
- Treybal R.E. "Mass Transfer Operations". McGraw-Hill, N.Y. (1980)
- Coulson J.M. and Richardson J.F. "Chemical Engineering". Pergamon Press (1971)

Software

Knowledge of basic MS Office package.

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this [link](#). To access the information, you will need to enter the course CODE