

Separation Operations

Code: 102403
ECTS Credits: 6

2025/2026

Degree	Type	Year
Chemical Engineering	OB	3

Contact

Name: Marina Guillen Montalban

Email: marina.guillen@uab.cat

Teachers

Antonio Javier Moral Vico

Teaching groups languages

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

Prerequisites

Having assisted to Termodinàmica Aplicada

Objectives and Contextualisation

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

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.
- 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.
- Develop personal attitude.
- Develop personal work habits.
- Develop thinking habits.
- Objectively compare and select different technical options for chemical processes.
- 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.
- 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

Learning Outcomes

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

Content

- 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

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Absorption	12	0.48	3, 5, 7, 4, 13
Batch distillation	12	0.48	3, 5, 9, 7, 11, 13
Binary rectification	12	0.48	3, 5, 9, 7, 12, 11, 13

Equilibrium stages	5	0.2	3, 9, 7, 4
Flash distillation	10	0.4	5, 9, 7, 13
Liquid-liquid extraction	14	0.56	3, 5, 9, 7, 13
Multicomponent distillation	18	0.72	3, 5, 9, 7, 4, 11, 13
Packed columns	10	0.4	3, 5, 7, 13
Type: Autonomous			
Exercise	7	0.28	3, 2, 5, 9, 7, 4, 12, 11, 13, 15
Study	28	1.12	1, 3, 2, 6, 5, 9, 7, 8, 4, 10, 12, 11, 13, 15, 14

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

The evaluation of the course will be carried out through the submission of a solved problem (15% of the final grade) and two tests (45% and 40%). To be eligible for the final average, it is necessary to have submitted the solved problem and to have obtained at least a 4 in each of the partial tests.

Students who do not pass the course through continuous assessment will have the right to a resit exam, which will include at least one exercise from each of the two previous tests (85%). A student will be considered "Not Assessable" (NA) if they have not participated in a set of activities (problem and both partial tests).

For each assessment activity, a location, date, and time will be specified for a review session during which the activity can be reviewed with the teaching staff. In this context, claims regarding the grade of the activity may be submitted and will be evaluated by the course instructor. If the student does not attend this review session, the activity will not be reviewed at a later time.

Honor enrollments Granting an honorific matriculation qualification is a decision of the faculty responsible for the subject. The regulations of the UAB indicate that MH 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 MH of the total number of students enrolled.

Notwithstanding other disciplinary measures deemed appropriate, the irregularities committed by the student that can lead to a variation in the rating of an evaluation act will be graded with a zero. Therefore, copying, plagiarizing, cheating, copying, etc. In any of the assessment activities it will imply failing with a zero. Assessment activities qualified in this way and by this procedure will not be recovered.

The use of AI is not allowed.

This course does not include a single assessment system.

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.

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this [link](#). To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	211	Spanish	first semester	morning-mixed
(PAUL) Classroom practices	212	Catalan/Spanish	first semester	morning-mixed
(SEM) Seminars	211	Spanish	first semester	morning-mixed
(SEM) Seminars	212	Catalan/Spanish	first semester	morning-mixed
(TE) Theory	21	Catalan	first semester	morning-mixed