

## Course guide

### 3200672 - OB2 - Basic Operations II

**Last modified:** 16/05/2025

**Unit in charge:** Terrassa School of Industrial, Aerospace and Audiovisual Engineering  
**Teaching unit:** 713 - EQ - Department of Chemical Engineering.

**Degree:** BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Compulsory subject).

**Academic year:** 2025    **ECTS Credits:** 6.0    **Languages:** Catalan

#### LECTURER

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**Coordinating lecturer:** Carrillo Navarrete, Fernando

**Others:** Escalas Cañellas, Antoni

#### PRIOR SKILLS

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Students will be expected to have passed the subjects on Fundamentals of Chemical Engineering and Basic Operations I.

#### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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**Specific:**

1. CHE: Knowledge of material and energy balances, biotechnology, the transfer of materials, separation operations, chemical reaction engineering, the design of reactors, and the reuse and transformation of raw materials and energy resources.

#### TEACHING METHODOLOGY

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- Face-to-face lecture sessions.
- Face-to-face practical work sessions.
- Independent learning and exercises.
- Preparation and completion of assessable activities individually.

In the face-to-face lecture sessions, the lecturer will introduce the basic theory, concepts, methods and results for the subject and use examples to facilitate students' understanding.

In the face-to face practical class work the lecturer will provide students with guidelines to analyse data for solving problems by applying methods, concepts and theoretical results.

Students will be expected to study in their own time so that they are familiar with concepts and are able to solve the exercises set, whether manually or with the help of a computer.

Students may come to office hours to resolve any doubts that may arise from the theoretical or applied content presented in class.

## LEARNING OBJECTIVES OF THE SUBJECT

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In this subject, students will learn the fundamentals of the unit operations of chemical engineering focus in separation.

Specific skills:

- To support the fundamentals of the unit operations of Chemical Engineering and to relate them to the other subjects that need the knowledge. Develop the ability to apply them in concrete situations.
- Develop the ability to decide with good criteria and calculate on the elements studied and adapt to new operations more or less related to them. Ability to use with good criteria the essential fundamentals of engineering necessary for the resolution of problems that are specific to the subject.
- Conèixer the theoretical bases for the calculation, design and selection of separation equipment.
- Discuss and optimize the knowledge of saving and energy efficiency applied to the industrial processes, to the extent that these are exhibited.

Generic skills:

- Capacity to raise and solve problems
- Self learning
- Analytical capacity
- Individual work capacity
- Management of the time and organization of the work.

## STUDY LOAD

Type	Hours	Percentage
Hours large group	30,0	20.00
Hours medium group	30,0	20.00
Self study	90,0	60.00

**Total learning time:** 150 h

## CONTENTS

### SEPARATION PROCESSES

**Description:**

1. Distillation:
  - 1.1. Differential distillation
  - 1.2. Flash distillation
  - 1.3. Continuous distillation with reflux
  - 1.4. Design of plate columns
  - 1.5. Packet columns
  - 1.6. Batch distillation
  - 1.7. Multicomponent distillation
2. Absorption of gases
3. Liquid-liquid extraction
4. Leaching
5. Other operations of separation: filtration, settling.

**Specific objectives:**

- Understand the theoretical basis for calculation, design and selection of separation equipment.
- Understand, calculate and design distillation processes:
- Understand and calculate the flash distillation
- Understand and calculate the continuous distillation with reflux applying McCabe-Thiele and Sorel-Lewis methods.
- Calculate a perforated plate column
- Calculate packet column.
- Understand and calculate batch distillation
- Study of multicomponent distillation
- Understand and calculate gas absorption process
- Understand and calculate liquid-liquid extraction
- Understand and calculate leaching process
- Understand and calculate filtration and settling

**Full-or-part-time:** 150h

Theory classes: 30h

Practical classes: 30h

Self study : 90h

## GRADING SYSTEM

First examination: 45%

Second examination: 45%

Tasks: 10%. This part will be assessed based on the effective work demonstrated in tasks related to the course content, some of which will be randomly selected and evaluated in person in the classroom.

The 1st and 2nd exams are individual, in-person tests conducted according to the schedule established by the ESEIAAT.

The grade from the 1st exam can be retaken through a make-up exam, which will take place on the same day and during the time slot of the 2nd exam. Any enrolled student may take this make-up exam. The grade obtained in the make-up exam will replace the initial grade only if it is higher.

For those students who meet the requirements and submit to the reevaluation examination, the grade of the reevaluation exam will replace the grades of all the on-site written evaluation acts (tests, midterm and final exams) and the grades obtained during the course for lab practices, works, projects and presentations will be kept.

If the final grade after reevaluation is lower than 5.0, it will replace the initial one only if it is higher. If the final grade after reevaluation is greater or equal to 5.0, the final grade of the subject will be pass 5.0.

## BIBLIOGRAPHY

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### Basic:

- McCabe, W. L.; Smith, J. C.; Harriott, P. Operaciones unitarias en ingeniería química. 7a ed. Madrid: McGraw-Hill, 2007. ISBN 9789701061749.
- Coulson, J. M.; Richardson, J. F. Ingeniería química, vols. 1, 2, 3, 4. Barcelona: Reverté, 1979-1981. ISBN 9788429171341.
- Martínez de la Cuesta, Pedro J.; Rus Martínez, Eloísa. Operaciones de separación en ingeniería química : métodos de cálculo. Madrid: Prentice Hall, 2004. ISBN 8420542504.

### Complementary:

- Montes Sánchez, Francisco Javier. Problemas resueltos de operaciones de separación. Madrid: Paraninfo, 2019. ISBN 9788428340762.
- Ocón García, Joaquín. Problemas de ingeniería química: operaciones básicas, vols. 1, 2. Madrid: Aguilar, 1963-1970. ISBN 8403209975.
- Vian, A.; Ocón, J. Elementos de ingeniería química: operaciones básicas. 5a ed. Madrid: Aguilar, 1967. ISBN 8403201532.
- Costa Novella, E. Ingeniería química, vols. 3, 4, 5. Madrid: Alhambra, 1983. ISBN 8420509892.
- Costa López, J. Curso de química técnica : introducción a los procesos, las operaciones unitarias y los fenómenos de transporte en la ingeniería química. Barcelona: Reverté, 1984. ISBN 8429171266.