



## Course guide

# 820528 - OBA2 - Unit Operations II

Last modified: 27/05/2024

**Unit in charge:** Barcelona East School of Engineering  
**Teaching unit:** 713 - EQ - Department of Chemical Engineering.

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

**Academic year:** 2024    **ECTS Credits:** 6.0    **Languages:** Catalan

### LECTURER

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**Coordinating lecturer:** ORIOL GIBERT AGULLO

**Others:**

Primer quadrimestre:  
FRANCISCO ESTRANY CODA - Grup: T1  
ORIOL GIBERT AGULLO - Grup: T1

Segon quadrimestre:  
FRANCISCO ESTRANY CODA - Grup: M10  
ORIOL GIBERT AGULLO - Grup: M10

### PRIOR SKILLS

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Find relevant information in the field of chemical engineering and correct oral and written expression, interpret graphs and diagrams, knowledge of transmission of heat and physicochemical

### REQUIREMENTS

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OPERACIONS BÀSIQUES I - Prerequisite

### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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**Specific:**

1. Understand mass and energy balances, biotechnology, mass transfer, separation operations, chemical reaction engineering, the design of reactors, and the recovery and processing of raw materials and energy resources.

**Transversal:**

2. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

### TEACHING METHODOLOGY

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### LEARNING OBJECTIVES OF THE SUBJECT

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To Acquire the necessary theoretical knowledge for the calculation and design industrial plants both mass transfer and simultaneous transfer of heat and matter, such as distillation, rectification continuous and discontinuous, solids drying, gas absorption, liquid-liquid extraction, etc..

To acquire analytical skills and ability to use information sources to solve exercises and problems of all these processes and facilities



## STUDY LOAD

Type	Hours	Percentage
Hours large group	60,0	40.00
Self study	90,0	60.00

Total learning time: 150 h

## CONTENTS

### 1. Introduction to the operations with mass transfer

**Description:**

Introduction to the operations with mass transfer. Diffusion. Film and double-film theories. Mass transfer coefficient.

**Full-or-part-time:** 2h

Theory classes: 2h

### 2. Distillation

**Description:**

Distillation. Liquid-vapor equilibrium. Flash distillation. Differential distillation. Rectification distillation. Column calculation. Hydraulic design.

**Full-or-part-time:** 10h

Theory classes: 10h

### 3. Air-water interaction

**Description:**

Humidity, dew point, humid temperature and adiabatic saturation temperature, enthalpy of air-water systems. Psychrometric diagram. Humidification, cooling, etc.

**Full-or-part-time:** 4h

Theory classes: 4h

### 4. Cooling towers

**Description:**

Industrial cooling circuits: open, closed and half open. Differential characteristics between them. Cooling towers: problematic and their specific characteristics.

**Full-or-part-time:** 4h

Theory classes: 4h

### 6. Absorption

**Description:**

Gas-liquid equilibrium. Absorption columns. Calculation and column design.

**Full-or-part-time:** 8h

Theory classes: 8h



## 7. Liquid-liquid extraction

### Description:

Liquid-liquid extraction of binary mixtures in one stage of equilibrium and in various stages of equilibrium. Specific diagrams. Mass balance and design equations.

**Full-or-part-time:** 8h

Theory classes: 8h

## 9. Adsorption

### Description:

Adsorption isotherms. Kinetics. Equipment.

**Full-or-part-time:** 8h

Theory classes: 8h

## GRADING SYSTEM

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## BIBLIOGRAPHY

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### Basic:

- McCabe, Warren L.; Smith, Julian C.; Harriott, Peter. Operaciones unitarias en ingeniería química. 7ª ed. Madrid [etc.]: McGraw-Hill, 2007. ISBN 9701061748.
- Martínez de la Cuesta, Pedro J.; Rus Martínez, Eloisa. Operaciones de separación en ingeniería química. Madrid [etc.]: Prentice Hall, 2004. ISBN 8420542504.
- Treybal, Robert Ewald. Operaciones de transferencia de masa. 2ª ed. México [etc.]: McGraw-Hill, 1988. ISBN 9686046348.
- Ocón García, Joaquín; Tojo Barreiro, Gabriel. Problemas de ingeniería química : operaciones básicas. 3ª ed. Madrid: Aguilar, 1968. ISBN 8403209975.

### Complementary:

- Manual del ingeniero químico [on line]. 4ª ed. Madrid [etc.]: McGraw-Hill, 2001 [Consultation: 08/06/2020]. Available on: [http://www.ingebook.com/ib/NPcd/IB\\_BooksVis?cod\\_primaria=1000187&codigo\\_libro=6572](http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=6572). ISBN 9788448612788.
- King, C. Judson. Procesos de separación. Barcelona: Reverté, 1980. ISBN 8429173013.
- Vian Ortuño, Ángel; Ocón García, Joaquín. Elementos de ingeniería química : operaciones básicas. 5ª ed. Madrid: Aguilar, 1967. ISBN 8403201532.
- Miranda Barreras, Angel Luis. Aire acondicionado. 5a ed. Barcelona: Ceac, 2004. ISBN 9788432910791.