

## SUBJECT TEACHING GUIDE

### 1060 - Advanced Separation Operations

### Master's Degree in chemical engineering

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Master's Degree in chemical engineering			Type and Year	Compulsory. Year 1
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Obligatory Subjects				
Course unit title and code	1060 - Advanced Separation Operations				
Number of ECTS credits allocated	6	Term	Annual based		
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIAS QUIMICA Y BIOMOLECULAR				
Name of lecturer	INMACULADA ORTIZ URIBE				
E-mail	inmaculada.ortiz@unican.es				
Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 2. DESPACHO INMACULADA ORTIZ URIBE (S2065A)				
Other lecturers	MARCOS FALLANZA TORICES CRISTINA GONZALEZ FERNANDEZ				

#### 3.1 LEARNING OUTCOMES

- Fundamentals and design of unit operations for the separation of multicomponent mixtures. Fundamentals and design of separation operations enhanced by chemical reactions. Fundamentals and design of membrane separation processes. Simulation and optimization of separation processes

#### 4. OBJECTIVES

Students should become familiar with i) Design of unit operations for the separation of multicomponent mixtures, ii) reactive separations, iii) membrane separations, iv) simulation and optimization of separation processes

6. SUBJECT PROGRAM	
CONTENTS	
1	<p>First part of the course.</p> <p>The first part will cover the design of unit operations for the separation of multicomponent mixtures and will be taught by prof. at the university of the Basque Country</p> <p>Thermodynamics and transport phenomena guiding the separation of multicomponent mixtures. Commercial software for prediction and calculus of characteristic parameters</p> <p>Proces synthesis, Simulation and optimization using commercial software</p>
2	<p>Second part of the course</p> <p>The second part of the course will cover theme 3, synthesis of reactive separations and , theme 4, Membrane separation technologies. Pressure driven membrane technologies, ultrafiltration, UF, nanofiltration, NF, reverse osmosis, RO, Forward osmosis, DO. Concentration driven membrane technologies, dialysis, electrodialysis, liquid membranes. Partial pressure driven membrane technologies, gas permeation, pervaporation, osmotic distillation</p> <p>This part will involve Master classes, seminars, tutorials and computer practicals</p>
3	As it is described

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Written exam of the first part of the course	Written exam	No	Yes	30,00
Written exam of the second part, together with the grades of team and individual works	Written exam	No	Yes	70,00
TOTAL				100,00
Observations				
In case of a health emergency, in which it is advised not to make the face-to-face defense of the Final Degree Project, online evaluation will be allowed				
Observations for part-time students				
Part-time students will have an exam of the theoretical and practical contents of the course				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
<p>Wankat, P., Separation Process Engineering: Includes Mass Transfer Analysis (5yh Edition). Ed. Prentice hall, 2022</p> <p>Theodore, L., Ricci, F., Mass Transfer Operations for the Practicing Engineer (Essential Engineering Calculations Series). Ed. Wiley, 2010</p> <p>Seader, J.D., Henley, E.J., Roper, D.K., Separation Process Principles, 4th ed. Ed. Wiley, 2019</p> <p>Introduction to Microfluidics , Patrick Tabelng , 2nd ed. Oxford university press, 2023, 42472060</p> <p>Benitez, J., Principles and Modern Applications of Mass Transfer Operations, Ed. Wiley, 2009.</p> <p>Basmadjian, D., Mass Transfer and Separation Processes: Principles and Applications, 2nd Ed., CRC Press, 2007</p> <p>Cristie, G., Transport Processes and Separation Process Principles (Includes Unit Operations), 4th Ed. Wiley, 2007</p>

