SUBJECT TEACHING GUIDE

G1629 - Advanced separation technologies

Degree in Chemical Engineering

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Degree in Chemical Engineering			Type and Year	Optional. Year 4
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	SUBJECT OPTION C: GUIDANCE IN ADVANCED CHEMICAL ENGINEERING Optional Module				
Course unit title and code	G1629 - Advanced separation technologies				
Number of ECTS credits allocated	6	Term		Semester based (1)	
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIAS QUIMICA Y BIOMOLECULAR
Name of lecturer	EUGENIO BRINGAS ELIZALDE
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Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 2. DESPACHO EUGENIO BRINGAS ELIZALDE (S2013)
Other lecturers	PEDRO MANUEL GOMEZ RODRIGUEZ MARTA HERRERO GONZALEZ

3.1 LEARNING OUTCOMES

- Be able to know the fundamentals and applications of rate-controlled separation processes:
  - Membrane-based separation processes
  - Solid-fluid separation processes

4. OBJECTIVES

Be able to know and understand from a qualitative and quantitative point of view the phenomena taking place in membrane units and adsorption/ion exchange columns.
Be able to identify and compare advanced separation processes on their application in solving separation problems in the context of industry and environment

6. COURSE ORGANIZATION

CONTENTS	
1	1. UNIT 1: Introduction to advanced separation processes 1.1. Introduction 1.2. Definition and classification of advanced separation processes 1.3. Examples of environmental and industrial applications
2	2. UNIT 2. Membrane-based separation processes 2.1. Pressure driven membrane processes: microfiltration (MF), ultrafiltration (UF), reverse osmosis (RO) and nanofiltration (NF). Fundamentals, design and applications. 2.2. Concentration gradient driven membrane processes: pervaporation, gas permeation, dialysis, membrane-based solvent extraction. Fundamentals, design and applications. 2.3. Other membrane-based separation processes: electrodialysis, forward osmosis and pressure retarded osmosis.
3	3. UNIT 3. Fluid-solid separation processes 3.1. Adsorption. Fundamentals, design and applications. 3.2. Ion Exchange. Fundamentals, design and applications.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Prersentation of practical sessions	Oral Exam	No	Yes	50,00
Portfolio	Others	No	Yes	50,00
TOTAL				100,00

Observations

The student not following the continuos assessment procedure will take a final exam in the dates previously scheduled.
In case of interruption of face-to-face learning by activation of health alert activation, the assesment procedure will not be modified and it will be performed using virtual tools.

Observations for part-time students

Article 24 from 'Reglamento de los Procesos de Evaluación en la Universidad de Cantabria' will be applied

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

WANKAT, P.C., Rate-Controlled Separations, 1996, Blackie Academic & Professional.
- SEADER, J.D., HENLEY, E.J. Separation Process Principles. 2006. 2nd Wiley & Sons.
- CUSSLER, E.L., Diffusion. Mass Transfer in Fluid Systems. 2009. 3rd Ed. Cambridge University Press.
- DRIOLI, E., CRISCUOLI, A., CURCIO, E., Membrane Contactors: Fundamentals, Applications and Potentialities. 2006. Elsevier.
- COULSON, J.M. RICHARDSON, J.F. Chemical Engineering (Particle Technology and Separation Processes). 2002. Oxford; Butterworth Heinemann, 2002