SUBJECT TEACHING GUIDE

G1629 - Advanced separation technologies

Degree in Chemical Engineering

Academic year 2019-2020

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
E-mail	eugenio.bringas@unican.es
Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 2. DESPACHO (S2013)
Other lecturers	PEDRO MANUEL GOMEZ RODRIGUEZ

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	%
Theoretical exams	Written exam	No	No	20,00
Prersentation of practical sessions	Oral Exam	No	Yes	50,00
Portfolio	Work	No	Yes	30,00
TOTAL				100,00

Observations
The student not following the continuos assessment procedure will take a final exam in the dates previously scheduled.

Observations for part-time students
Article VI 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