SUBJECT TEACHING GUIDE

G780 - Chemical Reactor Engineering

Degree in Chemical Engineering
First Degree in Chemical Engineering

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Degree in Chemical Engineering First Degree in Chemical Engineering			Type and Year	Compulsory. Year 3 Compulsory. Year 3
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Balances, Biotechnology, Separation, Chemical Reaction Engineering, Reactor Design, Assessment and Transformation of Resources Module: Compusory Training Industrial Chemistry				
Course unit title and code	G780 - Chemical Reactor Engineering				
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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Other lecturers	INMACULADA ORTIZ URIBE ALFREDO ORTIZ SAINZ DE AJA LUCIA GOMEZ COMA GUILLERMO DIAZ SAINZ

3.1 LEARNING OUTCOMES

- Fundamentals of the performance, design and optimization of homogeneous reactors with ideal flow patterns
  Flow patterns in chemical reactors
  Introduction to the fundamentals of heterogeneous reactors

4. OBJECTIVES

Understanding the phenomena guiding the performance of chemical reactors
Development of property, mass , thermal energy and momentum, balances in homogeneous reactors,
Solution of the mass , thermal energy and momentum balances in homogeneous reactors,

6. SUBJECT PROGRAM

CONTENTS	
1	THEME 1. Analysis and design of ideal reactors for homogeneous reactions 1.1.Chemical Reaction Engineering Fundamentals. Classification of homogenoeus reactors with respect to flow pattern. 1.2. Solution of the mass balance. Comparison of the performance of homogenoeus reactors with ideal flow for simple and complex reactions 1.3. Solution of the heat balance
2	THEME 2. Analysis and solution of the themal energy balance 3.1. Adiabatic reactors 3.2. Non-adiabatic reactors
3	THEME 3. Flow pattern characterization in chemical reactors 3.1 Fluid flow and mixing in chemical reactors 3.2 Laminar Flow Tubular reactors for homogeneous reactions . Turbulent flow tubular reactors

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
It consits on a written exam to evaluate the theoretical contents of Units 1 and 2 (22.5%)	Written exam	No	Yes	32,50
It consits on a written exam to evaluate the theoretical contents of Unit 3 (22.5%)	Written exam	No	Yes	32,50
The practical session will be evaluated following continuos assessment (35%)	Others	No	Yes	35,00
TOTAL				100,00

Observations

The continuous evaluation procedure (CE) consists of two written tests (65%) in which the theoretical contents of the different thematic blocks will be evaluated. The practical part (35%) will be evaluated through different tests scheduled throughout the term. In order to be evaluated by means of the EC procedure, it is compulsory to accredit an attendance percentage higher than 90% and to take all the proposed evaluation tests obtaining a minimum grade of 5.0.

In the case of not passing test 1 (week 7-8), it will be made up on the date of the ordinary exam. In the case of not passing test 2 (date of the ordinary exam), it will be made up on the date of the extraordinary exam. Those students who do not pass neither test 1 nor test 2, will be examined for the whole of the theory in the extraordinary exam. The grades of the practical part will be kept as long as they have been passed and the CE criteria have been fulfilled.

Students who do not pass the subject by means of CE will have the option of taking the final exam of the subject on the dates indicated in the ETSIIyT (minimum grade 5.0). This option will apply to both the ordinary and extraordinary exams. The practical part not evaluated by means of the CE procedure will be evaluated by means of a final exam of problems.

Observations for part-time students

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

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

- O.Levenspiel “Ingeniería de las Reacciones Química” Limusa Wiley (2004).
-H. Scott Fogler. “Elements of Chemical Reactor Engineering” Pearson Prentice Hall (2020)
- G.F.Froment, K.B.Brischoff “ Chemical Reactor Analysis and Design “ John Wiley (1990).
- E.B.Nauman “Chemical Reactor Design“ Krieger Pub. Co. (1992).
- L.K.Doraiswamy, M.M.Sharma, “Heterogeneus reactions. Analysis, examples and reactor design” John Wiley & Sons (1984).
- Y.T. Shah “Gas-Liquid-Solid reactor design” McGraw-Hill Inc. (1979).
- J.J.Carberry, A.Varma “Chemical reaction and Reactor Engineering” Marcel Dekker (1987).
- H.Rase “Chemical Reactor Design for Process Plants” Ann Arbor (1992).