

## SUBJECT TEACHING GUIDE

### G1631 - Optimization and Advance Control of Chemical Processes

#### 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	Optional. Year 4 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	G1631 - Optimization and Advance Control of Chemical Processes				
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	MARIA FRESNEDO SAN ROMAN SAN EMETERIO				
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Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 2. DESPACHO DE MARIA FRESNEDO SAN ROMAN SAN EMETERIO (S2012)				
Other lecturers	ANA MARIA URTIAGA MENDIA GABRIEL ZARCA LAGO				

### 3.1 LEARNING OUTCOMES

- To be able to design and operate methods for the advanced optimisation and control of chemical processes.

#### 4. OBJECTIVES

The main objectives are

- (i) to develop methods to discriminate between different process alternatives with the aim of designing chemical processes with maximum efficiency and minimum environmental impact.
- (ii) To develop concepts and methods to improve the performance of automatic control systems, thus improving both the productivity of chemical and biological processes and the use of resources, raw materials and energy, as well as product quality.

The methodology used to develop this theme will be based on practical examples of interest in the field of chemical engineering, solved using commercial simulation and process optimisation software.

#### 6. SUBJECT PROGRAM

##### CONTENTS

1	<p><b>BLOCK I. OPTIMISATION OF CHEMICAL PROCESSES</b></p> <p>Topic 1. Parametric estimation using specific software used in chemical process optimisation.</p> <p>Topic 2. Use of tools for sensitivity analysis and design specifications using specific software used in chemical process optimisation.</p> <p>Topic 3. Optimisation of specific objective functions by manipulation of variables using specific software used in chemical process optimisation.</p>
2	<p><b>BLOCK II. ADVANCED CONTROL OF CHEMICAL PROCESSES.</b></p> <p>Topic 4. Feedforward control.</p> <p>Topic 5. Cascade control en cascada, inferential control, selective control, adaptive control.</p> <p>Topic 6. Multiloop and multivariable control. Control loop interactions.</p> <p>Topic 7. Frequency response analysis.</p>

#### 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Portfolio 1- Optimisation of Chemical Processes.	Others	Yes	Yes	50,00
Portfolio 2- Advanced Control of Chemical Processes.	Others	Yes	Yes	50,00
<b>TOTAL</b>				<b>100,00</b>
<b>Observations</b>				
-The continuous assessment of the course involves passing (5.0) all the tests that make up the assessment method. -Otherwise, the student must pass the final examination (February session), which represents 100% of the course and leads to the final grade. -To be considered for continuous assessment, the student must attend at least 85% of the classes.				
<b>Observations for part-time students</b>				
Article 15 of Title VI. CONTINUOUS EVALUATION AND SINGLE EVALUATION FOR PART-TIME STUDENTS of the REGULATION ON EVALUATION PROCEDURES AT THE UNIVERSITY OF CANTABRIA shall apply.				

**8. BIBLIOGRAPHY AND TEACHING MATERIALS****BASIC****OPTIMIZACIÓN DE PROCESOS QUÍMICOS**

- Finlayson, B.A. Introduction to Chemical Engineering Computing. Ed. Wiley, 2006.
- Ralph, S. Teach Yourself the Basics of Aspen Plus. Ed. John Wiley & Sons, 2011.
- Seider, W.D., Seader, J.D, Lewin, D.R. Process Design Principles. Ed. Wiley & Sons, 1999.

**CONTROL AVANZADO DE PROCESOS QUÍMICOS**

- Seborg, D.E., Edgar, T.F., Mellichamp, D.A. Doyle, F.J. Process Dynamics and Control. 4th Edition. Ed. Wiley & Sons, 2017.
- Smith, C.A., Corripio, A.B. Principles and Practices of Automatic Process Control. 3<sup>a</sup> Edition. Ed. Wiley & Sons, 2006.