

## SUBJECT TEACHING GUIDE

G1631 - Optimization and Advance Control of Chemical Processes

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	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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Other lecturers	ANA MARIA URTIAGA MENDIA GABRIEL ZARCA LAGO				

### 3.1 LEARNING OUTCOMES

- To be able of designing and operating methods for the advanced optimization and control of chemical processes.

#### 4. OBJECTIVES

The main objectives are as follows:

- i) To develop methods that discriminate the different process alternatives aiming at the design of chemical processes with maximum efficiency and minimum environmental impact.
  - ii) To develop concepts and methods to enhance the performance of automatic control systems and thus improving both the productivity of chemical and biological processes and the use of resources, raw materials and energy and products quality.
- The methodology applied in the development of this subject is based on practical examples of interest in the field of chemical engineering solved by means of simulation and process optimization commercial software.

#### 6. COURSE ORGANIZATION

##### CONTENTS

1	<p><b>BLOCK I. OPTIMIZATION OF CHEMICAL PROCESSES</b></p> <p>Topic 1. Parametric estimation by using specific software employed in the optimization of chemical processes.</p> <p>Topic 2. Use of tools for sensitivity analysis and design specifications by using specific software employed in the optimization of chemical processes.</p> <p>Topic 3. Optimizing specific target functions through manipulation of the variables by using specific software employed in the optimization of chemical processes.</p>
2	<p><b>BLOCK II. ADVANCED CONTROL OF CHEMICAL PROCESSES.</b></p> <p>Topic 4. Cascade control, inferential control, selective control, adaptative control.</p> <p>Topic 5. Multiple loop control. Interaction of control loops.</p> <p>Topic 6. Strategies of control at the level of unitary operation. Cases of study: distillation column, catalytic reactors, pharmaceuticals production.</p> <p>Topic 7. Control of discontinuous processes.</p>

#### 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Test 1- Optimization of Chemical Processes.	Written exam	Yes	Yes	25,00
Individual work- Optimization of Chemical Processes.	Work	Yes	Yes	25,00
Test 2- Advanced control of Chemical Processes.	Written exam	Yes	Yes	25,00
Individual work- Advanced Control of Chemical Processes.	Work	Yes	Yes	25,00
<b>TOTAL</b>				<b>100,00</b>
<b>Observations</b>				
<p>-The continuous evaluation of the course involves overcoming (5.0) of all tests that comprise the method of evaluation. Otherwise, the student must pass evaluation by final exam (February session) representing 100% of the course and leading to the final mark.</p> <p>-To consider continuous evaluation assistance of at least 85% of classes is required.</p>				
<b>Observations for part-time students</b>				
Article 15 of the RULES OF EVALUATION PROCEDURE AT THE UNIVERSITY OF CANTABRIA will be applied.				

## 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.