# SUBJECT TEACHING GUIDE

## G1631 - Optimization and Advance Control of Chemical Processes

## Degree in Chemical Engineering

Academic year 2020-2021

| 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<br>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<br>GABRIEL ZARCA LAGO |

| 3.1 LEARNING OUTCOMES |
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| - 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 | BLOCK I. OPTIMIZATION OF CHEMICAL PROCESSES<br>Topic 1. Parametric estimation by using specific software employed in the optimization of chemical processes.<br>Topic 2. Use of tools for sensitivity analysis and design specifications by using specific software employed in the optimization of chemical processes.<br>Topic 3. Optimizing specific target functions through manipulation of the variables by using specific software employed in the optimization of chemical processes. |
| 2 | BLOCK II. ADVANCED CONTROL OF CHEMICAL PROCESSES.<br>Topic 4. Feedforward control.<br>Topic 5. Cascade control en cascada, inferential control, selective control, adaptive control.<br>Topic 6. Multiloop and multivaraible control. Control loop interactions.<br>Topic 7. Frequency response analysis. |

## 7. ASSESSMENT METHODS AND CRITERIA

| Description | Type | Final Eval. | Reassessn | % |
|---|---|---|---|---|
| Portfolio 1- Optimization of Chemical Processes. | Others | Yes | Yes | 50,00 |
| Portfolio 2- Advanced Control of Chemical Processes. | Others | Yes | Yes | 50,00 |
| TOTAL | | | | 100,00 |

**Observations**

-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.
-To consider continuous evaluation assistance of at least 85% of classes is required.

**Observations for part-time students**

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. 3ª Edition. Ed. Wiley & Sons, 2006.