# SUBJECT TEACHING GUIDE

## G1015 - Multivariable and Advanced Process Control

## Degree in Industrial Electronic Engineering and Automatic Control Systems
## First Degree in Industrial Electronic Engineering and Automatic Control Systems

Academic year 2024-2025

| 1. IDENTIFYING DATA | | | | | | |
|---|---|---|---|---|---|---|
| Degree | Degree in Industrial Electronic Engineering and Automatic Control Systems<br>First Degree in Industrial Electronic Engineering and Automatic Control Systems | | | Type and Year | Optional. Year 4<br>Optional. Year 4 | |
| Faculty | School of Industrial Engineering and Telecommunications | | | | | |
| Discipline | Subject Area: Systems and Automation Engineering<br>Optional Module | | | | | |
| Course unit title and code | G1015 - Multivariable and Advanced Process Control | | | | | |
| Number of ECTS credits allocated | 6 | Term | | Semester based (2) | | |
| Web | | | | | | |
| Language of instruction | Spanish | English Friendly | No | Mode of delivery | Face-to-face | |

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| Department | DPTO. TECNOLOGIA ELECTRONICA E INGENIERIA DE SISTEMAS Y AUTOMATICA |
| Name of lecturer | LUCIANO ALONSO RENTERIA |
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| Other lecturers | ALBERTO PURAS TRUEBA<br>MARIA SANDRA ROBLA GOMEZ |

### 3.1 LEARNING OUTCOMES

- Ability to analyze and design control systems using advanced techniques

## 4. OBJECTIVES

Describe the internal representation systems using state variables.
Present the possibilities for control of multivariable systems by state feedback.
Introduction to optimal control systems.
Study the techniques of nonlinear control systems.

## 6. SUBJECT PROGRAM

| CONTENTS | |
|---|---|
| 1 | CONTROL BY STATE VARIABLES<br>Description of physical systems using state variables.<br>Internal representation of systems.<br>Analysis of control systems with state variables.<br>State transition matrix.<br>Controlabilidad and observability.<br>State feedback.<br>Observer states. |
| 2 | OPTIMIZATION CONTROL SYSTEMS<br>Indices of behavior control systems<br>Optimization of continuous and discrete regulators.<br>Linear optimal quadratic regulator. |
| 3 | NONLINEAR CONTROL SYSTEMS<br>Description of nonlinear system by descriptive function.<br>Descrptive function of the most common nonlinearities.<br>Stability of nonlinear systems.<br>Control of nonlinear systems. |

## 7. ASSESSMENT METHODS AND CRITERIA

| Description | Type | Final Eval. | Reassessn | % |
|---|---|---|---|---|
| First laboratory practical exam | Laboratory evaluation | No | Yes | 20,00 |
| First theory exam | Written exam | No | Yes | 30,00 |
| Final laboratory practice exam | Laboratory evaluation | Yes | Yes | 20,00 |
| Final theory exam | Written exam | Yes | Yes | 30,00 |
| TOTAL | | | | 100,00 |

Observations

The remote evaluation of the work, practical laboratory exercises and written tests is foreseen, in the event of a new health alert by COVID-19 making it impossible to carry out the evaluation in person.

Observations for part-time students

For part-time students, a final exam will be held with a theory part and a practical part, with weights of 60% and 40% respectively.

## 8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

José Gómez Campomanes. "Automática: Anális y diseño de los sistemas automáticos de control". Ediciones Jucar
J. Pérez Oria. "Sistemas continuos de control". Rdiciones TDG.
Athans M. and P. Falb. "Optimal Control: An introduction to theory and its applications". Mc Graw-Hill.
Callier F. and C. Desoer. "Multivariable Feedback Systems". Springer-Verlag
Khlil H. "Non linear systems". Ed. Macmillan.