# 29726 - Automatic Systems

**Información del Plan Docente**

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| **Academic Year** | 2017/18 |
| **Faculty / School** | 110 - Escuela de Ingeniería y Arquitectura |
| **Degree** | 434 - Bachelor's Degree in Mechanical Engineering |
| **ECTS** | 6.0 |
| **Year** | 3 |
| **Semester** | Half-yearly |
| **Subject Type** | Compulsory |
| **Module** | --- |

## 1.General information

### 1.1.Introduction

In this course concepts of automation and automatic regulation of systems and processes, which are present in all industrial areas, both in products and processes of various kinds, are presented. The student learns how to specify and program the automation of discrete event systems, like manufacturing processes. The student learns how to model, analyze and adjust PID control systems, which dealing with the automatic regulation of more than 95% of continuous industrial processes (temperatures, pressures, flows, speeds, etc.)

### 1.2.Recommendations to take this course

It is recommended that the student is familiar with the mathematical tools for modeling physical systems of various kinds, with integral transforms, and with basic IT tools. This knowledge will be applied to conceive, analyze, simulate, and ultimately deploy control systems to achieve adequate automatic functioning.

### 1.3.Context and importance of this course in the degree

Automatic systems is a common subject to the industrial branch of engineering degrees, according to the Order CIN/35/2009 (BOE February 20, 2009). In this context the basics of control systems and processes are presented. Students have completed basic courses in previous semesters, required to understand the mathematical models of systems. The student learns in the course to work with discrete event systems, to analyze the transient and permanent behavior of systems, and in enabled to adapt it, according to the desired requirements, through appropriate control structures. At the end of the course the student is able to understand the significance of control systems and their importance in industrial processes.

### 1.4.Activities and key dates

The academic calendar of activities will be available on the website of the center. The student must be aware of the dates detailed practical work and delivery of work which will be duly informed both in class and through the LMS.

## 2.Learning goals

### 2.1.Learning goals

1. Identifies subsystems and relevant interconnections to automate the overall system.

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2. Selects the most appropriate techniques for modeling, analysis and design based on control requirements.
3. Applies the techniques and methods for the design of the control system meeting the performance specifications

## 2.2.Importance of learning goals

Learning outcomes of this course give the student ability to design, manage and improve control systems, ubiquitous in any industry and in many products: today the automatic control is considered essential to reduce costs, both economic and environmental, and increasing final product quality.

## 3.Aims of the course and competences

## 3.1.Aims of the course

- Knowing the basics of automated systems: specifications on the dynamic behavior of the controlled system, and how to meet them by interconnecting systems (plant and controller) through sensors and actuators.
- Modeling, analyzing and experiencing the dynamic behavior of systems.
- Specifying and programming logic automation systems.
- Specifying and implementing PID control loops.

## 3.2.Competences

Specific skills:

C23: Knowledge of the basics of automation and control methods.

Generic skills:

C4: Ability to solve problems and make decisions with initiative, creativity and critical thinking.

C6: Ability to use the techniques, skills and tools necessary for engineering practice thereof.

## 4.Assessment (1st and 2nd call)

## 4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

In each call, the evaluation will comprise two parts:

1. Individual written test (80%). Students must demonstrate their knowledge and skills by answering theoretical and practical questions and solving problems similar to those of classes and practices.
2. Evaluation of practical activities (20%). Along the course, prior preparation and performance during laboratory sessions and demonstrated ability to understand the concepts and results in practical assignments will be valued. Final evaluation will mostly consider the presentation of results of practical assignments, and it may include specific evaluation of the contents worked out in lab sessions, particularly for students who have not been evaluated along the course.

## 5.Methodology, learning tasks, syllabus and resources

## 5.1.Methodological overview

The process of teaching and learning will take place through: lectures (presentation of content), problems classes (examples and practical cases with active participation of students), laboratory practice (in small groups, with simulation tools or real systems) and conducting practical work and study supervised by teachers.

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## 5.2.Learning tasks

1) Lectures (30 classroom hours)

2) Problems and cases (15 classroom hours)

3) Laboratory practices (15 classroom hours)

4) Personal study and assessment tests (60 hours, including tutorials)

5) Practical assignment (30 hours, including tutorials necessary to guide and advise the student).

## 5.3.Syllabus

1. Automatica fundamentals.
2. Automation of discrete event systems. Programmable logic controllers (PLC's).
3. Dynamic behavior of continuous systems.
4. Feedback systems. Basic actions and control schemes. PID control.

## 5.4.Course planning and calendar

The schedule of the course for classroom and laboratory sessions is fixed by the Centre.

## 5.5.Bibliography and recommended resources

[BB: Basic Bibliography / BC: Complementary Bibliography]


- [BB] Franklin, Gene F.. Feedback control of dynamic systems / Gene F. Franklin, J. David Powell, Abbas Emami-Naeini . 6th ed. Upper Saddle River (New Jersey) : Pearson Prentice Hall, cop. 2010 [Material adicional en http://www.scsolutions.com/feedback-control-dynamic-systems-seventh-edition]
- [BB] Lewis, Paul H.. Sistemas de control en ingeniería / Paul H. Lewis, Chang Yang . 1a ed. en español Madrid : Prentice Hall, cop. 1999
- [BC] Àström, Karl Johan. Control PID avanzado / Karl J. à?ström, Tore Hägglund ; traducción y revisión técnica Sebastián Dormido Bencomo, José Luis Guzmán Sánchez . Madrid : Pearson Educación, D.L. 2009
- [BC] Åström, Karl Johan. Feedback Systems: An Introduction for Scientists and Engineers / Åström, Karl Johan and Murray, Richard M.. Princeton University Press, 2008[Comentario del profesor: Disponible online en: http://authors.library.caltech.edu/25062/]
- [BC] Golnaraghi, Farid. Automatic control systems / Farid Golnaraghi, Benjamin C. Kuo . 9th ed. New York : John Wiley & Sons, cop. 2010
- [BC] Ogata, Katsuhiko. Ingeniería de control moderna / Katsuhiko Ogata ; traducción Sebastián Dormido Canto, Raquel Dormido Canto ; revisión técnica Sebastián Dormido Bencomo ; revisión técnica para Latinoamérica Amadeo Mariani ... [et al.] . 5ª ed. Madrid : Pearson Educación, D.L. 2010
- [BC] Smith, Carlos A.. Principles and practice of automatic process control / Carlos A. Smith, Armando B. Corripio . 3rd ed. Hoboken, NJ : John Wiley & Sons, cop. 2006