

67223 - Electronic System Design

Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	527 - Master's in Electronic Engineering
ECTS	6.0
Year	1
Semester	Second semester
Subject Type	Compulsory
Module	---

1.General information

1.1.Introduction

This course is raised in the Master's of Electronic Engineering to complement the knowledge and skills of students in the fields of Electronics and Control Systems.

1.2.Recommendations to take this course

Students of this master are graduates who have completed courses in which the bases of these materials are presented. Students who by their degree of origin have not completed are required to study subjects related with digital and power electronics and with the control and automation systems.

1.3.Context and importance of this course in the degree

This course provides an integrated view, where advanced techniques are developed two disciplines: the design of electronic systems based on analog, digital and power circuits and the control theory.

1.4.Activities and key dates

A detailed analysis of the various activities to develop will be established once the University and the Center have approved the academic calendar (which can be consulted on the website of the EINA).

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

The student, for passing this subject, should demonstrate the following results: Developes an electronic project with parts of specification, design, installation and project documentation . Builds blocks using analog, digital and power circuits. The

67223 - Electronic System Design

verified in the laboratory. Knows the basic rules and know how to write the documentation associated with an electronic project. Applies the techniques of computer control design for multivariable systems. Knows and knows how to apply the techniques of analysis and design based on the state space and observers. Knows and applies identification techniques to extract dynamic models of real systems systems and simulate their behavior. Can design a control architecture of a complex system and choose the right technology for each component associated implementing regulations.

3.2.Competences

4.Assessment (1st and 2nd call)

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

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. It provides an integrated view, where advanced techniques of two disciplines are developed: the control theory and design of electronic systems based on analog, digital and power circuits.

5.2.Learning tasks

The course includes the following learning tasks:

Classroom activities (2.4 ECTS: 60 hours)

- **Lectures** (42 hours). Explanation of theoretical contents with examples. The topics are the fundamentals of advanced control theory (30 hours) and of electronic design (12 hours). Moreover, problem-solving and cases will be solved by the students in order to relate theoretical and practical concepts. Students will solve the problems as homework.
- **Practice session** (18 hours). Analog and digital circuits will be implemented, paying special attention to the design method and the operation of the circuit. The student will practice with the instruments and software tools needed to develop the proposed circuits. The student will be guided during the practice sessions so the initial steps of the practical work will be given in some parts of the sessions.

Autonomous work (3.6 ECTS: 90 hours)

- **Assignment** (40 hours). The student will work on the implementation of a circuit, board and the algorithms to control a real system. A document will be elaborated with the methods and results of the assignment.
- **Personal study** (46 hours): The students themselves must work/study in the interpretation and understanding of the course contents. The tutorials will help the student to interact with the teacher and to solve doubts about theoretic and practical concepts.
- **Evaluation test** (4 hours). The final grade will be based on this activity. Other activities made during the course can also help the student to assimilate how they are understanding the concepts dealt with in the course.

5.3.Syllabus

The course will address the following topics:

Section 1. Advanced control skills

1. Modelling of systems with internal description.

67223 - Electronic System Design

2. Multivariable continuous and sampled systems.
3. Stability. Controllability and observability.
4. Linear control based on internal description.
5. Observers. Control design variables estimation.
6. Nonlinear control.

Section 2. Advanced electronic design skills

1. Top- Down methodology for electronic design.
2. Prototyping techniques in digital and analog systems.
3. Implementation of control systems in electronics (instrumentation, A/D conversion, microprocessor hardware implementation).
4. Documentation and debugging an electronic design.

5.4.Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the website of the EINA.

5.5.Bibliography and recommended resources

- Phillips, C. L., & Nagle, H. j. (1993). Sistemas de control digital : análisis y diseño. Barcelona [etc.] : Gustavo Gili, 1993.
- Ogata, K. Ingeniería de Control Moderna: Prentice Hall, 5a edición.
- Moreno, Garrido y Balaguer. Ingeniería de Control: Ariel Ciencia. B. Kuo. Sistemas de control automático (Prentice-Hall).
- Horowitz, Paul. "The art of electronics"; Winfield Hill, 2nd ed., reimp. 1997 Cambridge : Cambridge University Press, 1989.