

67237 - Advanced Control and Electronic Implementation

Syllabus Information

Academic year: 2024/25

Subject: 67237 - Advanced Control and Electronic Implementation

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 622 - Master's in Electronic Engineering

ECTS: 6.0

Year: 1

Semester: First semester

Subject type: Compulsory

Module:

1. General information

This subject offers an integrating vision, where the advanced techniques of two disciplines are developed: control and design of electronic systems based on analogue, digital and power circuits. The basic applications and functions of each discipline are discussed, a control design based on a real problem is introduced and an overview of the electronic implementation of control techniques in a circuit is given.

This subject is part of and completes the overview of electronics (digital and analogue branches) and control theory that started with the fundamental subjects of control and electronics.

2. Learning results

Upon completion of this subject, the student will be able to:

- Develop an electronic project with the specification, design, assembly and documentation parts of a project.
- Build blocks using analogue, digital and power circuits. Verify them in the laboratory.
- Knows the basic regulations and how to draft the documents associated with an electronic project.
- Know and know how to apply computer control design techniques for multi-variable systems.
- Know and know how to apply state-space and observer-based analysis and design techniques.
- Know and apply dynamic systems identification techniques to extract models of real systems, and simulate their behaviour.
- Know how to design a control architecture of a complex system and choose the appropriate technology for each component by applying the associated standards.

3. Syllabus

The contents developed to cover the advanced control competencies are:

- Modelling of systems with internal description.
- Continuous and sampled multivariable systems
- Stability. Controllability and observability.
- Linear control based on internal description.
- Observers. Control design with variable estimation.
- Non-linear control.

The contents developed to cover the advanced electronic design competencies are:

- Top-Down methodology for electronic design.
- Prototyping techniques in digital and analogue systems.
- Implementation of control systems in electronic circuits (instrumentation, A/D conversion, hardware implementation in microprocessors).
- Documentation and debugging of an electronic design.

4. Academic activities

THEORY-PRACTICE: (66 classroom hours)

- 1) Lecture (45h). It includes theoretical and problem-solving classes. The student will be encouraged to pre-work the problems.
- 2) Laboratory sessions (15h). Study and implementation of electronic circuits and integration of the corresponding control algorithm.
- 3) Assessment tests (6h)

PERSONAL STUDY: (84 hours)

5. Assessment system

The subject is organized in two blocks:

- Theory and problems (CT, 75 %)
- Laboratory sessions (CP, 25 %)

In order to pass the course, it is essential to obtain both grades CT and CP equal or higher than 5/10. Otherwise, the overall grade will be saturated in 4/10. When the grade of a block is equal or higher than 5/10, that block will be kept during the whole academic year, so it will not be necessary to take that block in the following global exams.

1. CONTINUOUS EVALUATION

It will be carried out throughout the corresponding semester, on the dates set by the professors.

CT:

- Three milestones (theory tests and problems). Each milestone will have an Electronics part and a Control part.
- In order to opt to be evaluated the Theory-Problems block by continuous evaluation, the grade in each part (Electronics and Control) of each milestone must be equal or higher than 3/10.

CP:

- A test during the realization of each laboratory session.
- To be eligible for the evaluation of the Practical block by continuous evaluation, the grade in each test of each practical must be equal or higher than 3/10.

2. GLOBAL EVALUATION

The global evaluation exams will be carried out exclusively on the dates established by the center.

CT:

- Exam of the Theory-Problems block, divided into two parts (Electronics and Control).
- In order to pass this block by global evaluation, the grade in each part must be equal or higher than 3/10.

CP:

- Exam of the Laboratory sessions, divided into two parts (Electronics and Control).
- In order to pass this block by global evaluation, the grade in each part must be equal or higher than 3/10.

6. Sustainable Development Goals

7 - Affordable and Clean Energy

8 - Decent Work and Economic Growth

9 - Industry, Innovation and Infrastructure