Universidad Zaragoza

Academic Year/course: 2024/25

30025 - Control Engineering

Syllabus Information

Academic year: 2024/25
Subject: 30025 - Control Engineering
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 436 - Bachelor's Degree in Industrial Engineering Technology
ECTS: 6.0
Year: 3
Semester: Second semester
Subject type: Compulsory
Module:

1. General information

The objective of this subject is to learn the fundamental contents of computer control. You will learn to describe, simulate and analyze the behavior of discrete-time systems of one or several variables, and to design digital regulators. The importance of distributed automation and control systems will be studied. It is recommended to have previously taken the subject "Sistemas Automáticos".

2. Learning results

- Design and implement the computer-based control of a system, selecting the most appropriate technique according to the control requirements and the context in which they arise.
- Apply system identification techniques in order to extract mathematical models suitable for use in control.
- Simulate the behavior of dynamical systems using appropriate computer tools.
- Design a distributed control hierarchy, solving both the communication needs between the different elements of the control and the computerized supervision of the whole.

3. Syllabus

Unit 1. Introduction

Unit 2. Computer control of continuous systems

- Introduction
- Sampling and reconstruction
- Z-transform
- Description of sampled systems
- Discretization of continuous systems
- Analysis of sampled systems
- Regulator design

Unit 3. Internal system description

- Continuous and sampled systems
- Basic operations in state space
- Transient and permanent response
- Controllability and observability
- Status feedback control

Unit 4. Discrete event systems

- Introduction
- Deterministic Finite State Automata (FSA)
    - Mealy and Moore models
    - Transformations and minimization
    - Limitations of DFAs
- Petri Nets
    - Concept, typical structures and modeling methodology
    - Property analysis

4. Academic activities

Lectures (28 hours)

Sessions of masterly presentation of theoretical and practical contents. Participation is encouraged through questions and brief discussions.

Problem solving classes (14 hours)

Coordinated at all times with the theoretical contents. Preliminary work on problems is encouraged.

Laboratory sessions (18 hours)

They include a preliminary study and practical laboratory sections.

Study (84 hours)

Personal study of theoretical concepts, problem solving and preparation of laboratory sessions.

Assessment tests (6 hours)

5. Assessment system

The grade in the **global** assessment modality will comprise two parts:

Theory and problems grade (CT, 80%)

Written test with problems and/or theoretical-practical questions. The student will be assessed on the set of learning results from a theoretical and problem-solving point of view. Graded between 0 and 10 points.

Laboratory sessions grade (CP, 20%)

It can be passed throughout the term (gradual test). In any case, a specific test will be held during the examination period for students who have not passed it during the term, including exercises from the laboratory practices and/or practical work. The student will be evaluated on the set of learning outcomes from the practical point of view. Graded between 0 and 10 points.

In order to pass the subject **it is an essential condition to obtain both grades CP and CT higher or equal to 4** points out of 10. Only in that case, the overall grade for the subject will be $0.8 \cdot CT + 0.2 \cdot CP$. Otherwise, the overall grade will be the minimum between 4 and the result of applying the above formula. The subject is passed with an overall grade of 5 points out of 10.

6. Sustainable Development Goals

7 - Affordable and Clean Energy
8 - Decent Work and Economic Growth
9 - Industry, Innovation and Infrastructure