

29624 - Control Engineering

Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	430 - Bachelor's Degree in Electrical Engineering
ECTS	6.0
Year	3
Semester	First semester
Subject Type	Compulsory
Module	---

1.General information

1.1.Introduction

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

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

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

This course is divided in two main parts: (1) digital control of continuous systems and (2) modeling, analysis and design of discrete event systems. The teaching process will involve three main activities : lectures , problems resolution and laboratory classes.

- During the lectures, theoretical and methodological concepts will be presented by using practical examples .
- During the problem resolution classes, different problems will be developed with the participation of students.

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- Laboratory sessions will be developed individually or in groups of two students, where students will put into practice the concepts of interest, implement control systems on real systems and simulate using the computers the evolution of systems.

5.2.Learning tasks

The activities for the student include the following.

1) Lecture classes (type T1) (30 hours).

Lecture sessions of theoretical and practical content. The concepts of digital control of continuous systems and modeling, analysis and control of discrete event systems are introduced by using real examples. Student participation through questions and brief discussions is encouraged.

2) Classes of problems and resolution of use cases (type T2) (15 hours).

Problems and case studies with student participation, coordinated at all times with the theoretical contents are developed. Students are encouraged to work the problems previously.

3) Laboratory sessions (type T3) (15 hours).

The student performs simulation, design and implement control systems on real systems. The sessions consist in a preliminary study and a practical realization in the laboratory. The preliminary study should be done prior to practice.

4) Study (type T7) (86 hours).

Student personal study of theoretical concepts and implementation problems. The ongoing work of the student is encouraged by the homogeneous distribution throughout the semester of the various learning activities. This includes tutorials, as a direct student care, identification of learning problems, guidance on the subject, attention to exercise and doubts.

5) Evaluation exams (T8) (4 hours).

In addition to the qualifying function, evaluation is also a learning tool with which the student checks the degree of understanding and assimilation reached.

5.3.Syllabus

The course contents are:

• Topic 1: Introduction

• Topic 2: Digital control of continuous systems

Discrete-time signals

Z transform: definition, properties, tables

Description of sampled systems

Discretization of continuous systems

Sampled Systems Analysis

Design of digital controllers

Practical aspects of implementation

• Topic 3: Discrete (event) systems

Preliminary considerations and definition

Formalisms to represent the DES and interest in engineering

Deterministic Finite Automaton (DFA)

Mealy and Moore models. Transformations and minimization

Limitations of DFA

Petri nets

Concept, typical structures and modeling methodology

Some properties, analysis and implementation techniques

Five laboratory sessions will be performed.

• Digital control of a servomechanism (discretization of continuous controllers).

• Digital control of a servomechanism (direct design).

• Control of a discrete event system (DFA implementation).

• Control of a flexible manufacturing cell (Petri net implementation).

• Analysis of discrete systems in MATLAB

5.4.Course planning and calendar

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All classes are scheduled by EINA and are available on its website (<https://eina.unizar.es/>).

Each teacher publishes its schedule of office hours .

The other activities are planned depending on the number of students and are available at <http://add.unizar.es>

5.5. Bibliography and recommended resources

[BB: Bibliografía básica / BC: Bibliografía complementaria]

- [BB] Cassandras, Christos G.. Introduction to discrete event systems / by Christo G. Cassandras, Stéphane Lafortune . - 2nd ed., 2nd print. New York : Springer, 2010
- [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
- [BB] Moreno, Luis. Ingeniería de control : modelado, análisis y control de sistemas dinámicos / Luis Moreno, Santiago Garrido y Carlos Balaguer . - 1ª ed. Madrid: Ariel, 2003
- [BB] Ogata, Katsuhiko. Sistemas de control en tiempo discreto / Katsuhiko Ogata ; traducción, José Guillermo Aranda Pérez...[et al.] . - 2a ed. México [etc.] : Prentice Hall Hispanoamericana, cop. 1996
- [BB] Silva Suárez, Manuel. Las redes de Petri : en la automática y la informática / Manuel Silva . - 1a ed. 1985, 1a reimp. 2002 Madrid : Editorial AC, 2002
- [BB] 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
- [BC] Balcells Sendra, Josep. Autómatas programables / Josep Balcells, José Luis Romeral Barcelona : Marcombo Boixareu, D.L. 1997
- [BC] Bolton, W.. Ingeniería de control / W. Bolton . - 2a. ed. México : Alfaomega ; Barcelona : Marcombo, cop. 2001
- [BC] Lewis, Paul H.. Sistemas de control en ingeniería / Paul H. Lewis, Chang Yang . - 1a ed. en español Madrid : Prentice Hall, cop. 1999
- [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

Listado de URL

- Transparencias y apuntes de la asignatura, hojas de problemas y Guiones de prácticas disponibles en <http://add.unizar.es>. [<http://add.unizar.es>.]