Academic Year/course: 2021/22

30025 - Control Engineering

Syllabus Information

Academic Year: 2021/22

Subject: 30025 - Ingeniería de control

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

2. Learning goals
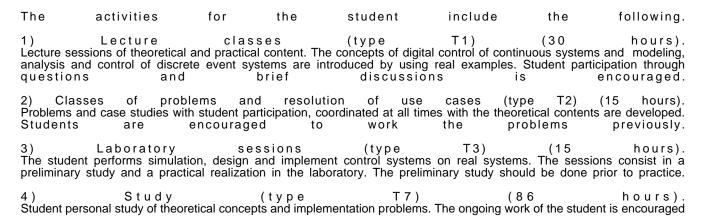
3. Assessment (1st and 2nd call)

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

This course is divided in three main parts: (1) digital control of continuous systems; (2) state space representation and (3) 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.
- 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.

4.2. 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.

4.3. 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

- Topic 3: Internal description systems.

    Internal description of continuous systems

    Internal description of sampled systems

    Basic operations in the state space

    System poles

    Stationary response

    Controllability and observability

    Feedback control

- Topic 4: 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 related to the topics of the course.

4.4. Course planning and calendar

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

Each professor publishes his/her schedule of office hours.

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

4.5. Bibliography and recommended resources

Link:
http://biblos.unizar.es/br/br_citas.php?codigo=30025&year=2019