Universidad Zaragoza

Academic Year/course: 2023/24

30305 - Signals and systems

Syllabus Information

Academic year: 2023/24
Subject: 30305 - Signals and systems
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 330 - Complementos de formación Máster/Doctorado
581 - Bachelor's Degree in Telecommunications Technology and Services Engineering
ECTS: 6.0
Year: 330 - Complementos de formación Máster/Doctorado: XX
581 - Bachelor's Degree in Telecommunications Technology and Services Engineering: 2

Semester: First semester
Subject type: 581 - Compulsory
330 - ENG/Complementos de Formación
Module:

1. General information

The objective of the *Signals and Systems* subject is to provide the student with the basic methodologies and tools for the analysis of signals and systems in the time, frequency and Laplace transform domains. The emphasis is on the student mastering the analysis tools in each domain as well as the transformation tools between the three domains. A large number of subsequent subjects, both in the subject itself and in the rest of the degree, will make extensive use of the techniques studied in this subject. Important applications include communications, electronic systems and signal processing.

These approaches and objectives are aligned with the Sustainable Development Goals (SDGs) of the 2030 Agenda of United Nations (https://www.un.org/sustainabledevelopment/es/). specifically, the learning activities planned in this subject will contribute to the achievement of targets 9.5 and 9.c of Goal 9, and target 8.2 of Goal 8.

2. Learning results

- To know the elementary signals

- To understand the properties and transformations of signals.

- Know how to distinguish between different types of systems, among them especially linear and time invariant systems, know their fundamental properties and interconnection modes.

- To understand and correctly use the convolution operation as a fundamental tool to be able to operate with linear and time invariant systems . To know their properties and their graphical interpretation.

- To understand and know how to use the concept of impulse response as a defining characteristic of linear and time-invariant systems.

- To know the representation and frequency characterization of signals and systems, as well as their fundamental properties.

- To know the process of sampling a signal in continuous time as well as its reconstruction from samples taken at regular intervals, both from the point of view of the time domain and from the frequency point of view. Understand the concept of aliasing.

- Use scientific programming tools in the field of signal processing.

- To know the representation and characterization of signals and systems in the Laplace domain, as well as their fundamental properties.

3. Syllabus

Unit 1. Programming with Matlab/Octave

Unit 2. Signals and systems over time

2.1 Signals

2.2 Systems

Unit 3. Linear and invariant systems

3.1 Convolution and impulse response

3.2 Systems defined by differential equations and equations in finite differences

3.3 Correlation

Unit 4. Frequency representation of signals

4.1 Continuous time-periodic signals: Fourier series development

4.2 Continuous time Fourier transform

Unit 5. Systems analysis

5.1 LTI systems: frequency response

5.2 Applications

5.3 Laplace Transform

4. Academic activities

Lectures: 40 hours

Presentation by the professor of the contents of the course

Problem solving and case studies: 10 hours

Resolution by the students, guided by the teacher, of problems related to the syllabus.

Laboratory practices: 10 hours

It will comprise 5 sessions of 2 hours each. At the end of the session, students will complete a questionnaireregarding the work done.

Teaching assignments: 24 hours

Two types of teaching assignments are proposed: i) resolution, individually or in groups, of problems related to the syllabus and whose level of difficulty will be similar to that of the final exam; ii) resolution of several practical tasks related to the contents of the subject.

Personal study: 60 hours

Assessment tests. 6 hours

5. Assessment system

The student will have a global test in each of the exams established throughout the term. Dates and schedules will be determined by the School. The grade for this test will be obtained as follows: **E1: Final exam (60%).**

Written exam, with a score from 0 to 10 points, common for all groups of the subject. A minimum score of 5 points in the final exam is requiredto pass the subject.

T1: Tutored practical work and problem solving (20%).

Scoring from 0 to 10 points. The assessment of the tutored work proposed during the semester will take into account both the material presented and the suitability and originality of the proposed solution. The solved problems will be evaluated for their solution. Students who do not take these assessment activities on the assigned dates must take an alternative test on the same date as the final exam.

T2: Laboratory practices (20%).

Scoring from 0 to 10 points. The evaluation of the practices will be carried out through questionnaires at the end of the practice, as well as the work done during it. Students who do not take them on the assigned dates must take an alternative test on the same date as the final exam.