Universidad Zaragoza

Year : 2020/21

30333 - Digital Signal Processing Applications

Syllabus Information

Academic Year: 2020/21
Subject: 30333 - Digital Signal Processing Applications
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 438 - Bachelor's Degree in Telecomunications Technology and Services Engineering
330 - Complementos de formación Máster/Doctorado
ECTS: 6.0
Year: XX
Semester: 330 - Second semester
438 - First semester
438 - First semester
438 - First semester
Subject Type: ENG/Complementos de Formación
Module: ---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The learning process designed for this subject is based on:

- **M1: Participative lecture (40 hours)**. Presentation by the lecturer of the main contents of the course. This activity will take place in the classroom. Theoretical knowledge is provided to the students in such a way that it will allow them to achieve all the specified learning outcomes and all the specified competencies. To provide students with practical knowledge about the use of signal analysis tools and systems, a number of practical examples with Matlab software will take place in the classroom. This course is designed to provide students with theoretical knowledge enabling them to achieve the specified learning outcomes and competences.
- **M4: Supervised practical work (14 hours)**. As the subject progresses, the lecturer will request deliveries associated with the resolution of practical problems in teams for several parts of the syllabus. Results must be submitted in time and in the correct format, according to the instructions of the lecturer. This activity is designed to consolidate all specified learning outcomes and competencies as well as their development. The results of these tasks are one of the evaluation activities (T1).

- **M11: Supervision of practical works (1 hora)**. While performing practical work each team must meet regularly with the lecturer in order to follow up on the work, assess the project progress and to get the answer to the questions that could have arisen.). Learning outcomes and competencies that students acquire through this activity are shared by activity M4. This is one of the evaluation activities (T1).
- **M9 y M15: Work associated with Laboratory Sessions**. (M9) involves 10 hours in the computer classroom, distributed in 5 practical sessions. The efficient achievement of the sessions time requires some previous preparation of the work and some after-lab work with the obtained results to settle the concepts (M15). Through these activities, all specified learning outcomes and competencies are strengthened and reinforced. Students will learn how to use specific tools to implement and simulate digital signal processing systems. In the documentation delivered, each student will be able to find a detailed description of the activities to be performed in and out of the lab, as well as the way in which the student must demonstrate the acquisition of the relevant results and competences since this work belongs also to one of the evaluation activities (T2).
- **M10: Office tutor hours.** Time for personalized attention to students with the aim of reviewing and discussing the materials and topics presented in both theoretical and practical classes.
- **M11: Evaluation**. Set of theoretical-theoretical written tests and reports used in the evaluation of student's progress. The details are in the section on evaluation activities

4.2.Learning tasks

- **Introduction to the Course.**

  Techniques and Applications of Digital Signal Processing. (M1: Participative Lectures; M11: Evaluation)

  Characterization of discrete-time processes. (M1: Participative Lectures; M11: Evaluation)

- **Estimation and Detection.**

  Parameter estimation. (M1: Participative Lectures; M9 y M15: Work associated with Laboratory Sessions; M11: Evaluation).

  Spectral estimation. (M1: Participative Lectures; M9 y M15: Work associated with Laboratory Sessions; M11: Evaluation).

  Event detection. (M1: Participative Lectures; M9 y M15: Work associated with Laboratory Sessions; M11: Evaluation).

  Applications. (M1: Participative Lectures; M9 y M15: Work associated with Laboratory Sessions; M4: Supervised practical work. M11: Evaluación).

- **Optimal Linear Filtering.**

  Wiener optimal linear FIR filtering. (M1: Participative Lectures; M9 y M15: Work associated with Laboratory Sessions; M11: Evaluation).

  Adaptive Filtering. (M1: Participative Lectures; M11: Evaluation).

  Applications. (M1: Participative Lectures; M9 y M15: Work associated with Laboratory Sessions; M4: Supervised practical work. M11: Evaluation).

- **Orthogonal transforms and data compression.**

  Orthogonal transforms (M1: Participative Lectures; M9 y M15: Work associated with Laboratory Sessions; M11: Evaluation).

  Compresión de datos. (M1: Participative Lectures; M9 y M15: Work associated with Laboratory Sessions; M11: Evaluation).

  Aplicaciones. (M1: Participative Lectures; M9 y M15: Work associated with Laboratory Sessions; M4: Supervised practical work. M11: Evaluation)

- **Non-linear filtering.**

  Basic techniques of non-linear filtering. (M4: Supervised practical work. M11: Evaluation)

  Applications. (M4: Supervised practical work. M11: Evaluation)

4.3.Syllabus

The course will address the following topics:

- 1. Introduction
  - 1.1. Techniques and Applications of Digital Signal Processing.
  - 1.2. Characterization of discrete-time processes.
- 2. Estimation and Detection

    - 2.1. Parameter estimation.
    - 2.2. Spectral estimation.
    - 2.3. Event detection.
    - 2.4. Applications.
- 3. Optimal linear filtering
    - 3.1. FIR Wiener optimal filtering.
    - 3.2. Adaptive filtering.
    - 3.3. Applications.
    - 3.4. Modeling: prediction of speech signals, equalization, etc.
- 4. Orthogonal transforms and data compression
    - 4.1. Orthogonal transforms.
    - 4.2. Data compression.
    - 4.3. Applications.
- 5. Non-linear Filtering.
    - 5.1. Basic techniques of non-linear filtering.
    - 5.2. Applications.

4.4.Course planning and calendar

The course schedule, including classroom and laboratory sessions will be determined by the academic calendar stablished by the Center for the corresponding course.

4.5.Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=30333&year=2019