

Academic Year/course: 2022/23

30318 - Digital Communications

Syllabus Information

Academic Year: 2022/23

Subject: 30318 - Digital Communications

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 438 - Bachelor's Degree in Telecommunications Technology and Services Engineering
581 - Bachelor's Degree in Telecommunications Technology and Services Engineering

ECTS: 6.0

Year: 581 - Bachelor's Degree in Telecommunications Technology and Services Engineering: 3
438 - Bachelor's Degree in Telecommunications Technology and Services Engineering: 2

Semester: 438 - Second semester

581 - First 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

The learning process is based on the following methodology:

M1: Lectures.

M4: Miniprojects.

M8: Practical classes.

M9: Laboratory work.

M10: Tutoring.

M11: Assesment

4.2. Learning tasks

A1: Lectures (40 hours). The teacher presents the theory and students participate actively. This methodology, is designed to provide students with the theoretical foundations of the subject and requires individual home work from the student (M14).

A2: Practical classes (10 hours). The students solve problems to consolidate the theoretical concepts from the lectures.

A3: Lab work (10 hours). There will be 5 sessions of 2 hours. The students are provided with a series of problems to solve, which include the main blocks of a digital communication system, to consolidate the theoretical concepts from the lectures.

A4: Miniprojects (20 hours). The students develop an implementation of the theory concepts of the course using a simulation environment provided by the teacher. Then they write a report and make an oral presentation

A5: Tutoring. The teacher answers questions to the students with the aim of reviewing and discussing the materials and topics presented both theoretical and practical.

A6: Evaluation. The evaluation is done using the lab reports, project work and written tests described in the evaluation

section.

4.3. Syllabus

The program of the course is the following:

1. Synchronization in digital communication systems

- 1.1. Carrier synchronization
- 1.2. Symbol synchronization
- 1.3. Frame synchronization

2. Basic information theory and source coding

- 2.1. Information measure, Entropy and channel capacity.
- 2.2. Discrete source coding
- 2.3. Analog source coding
 - Linear and logarithmic coding
 - Differential coding

3. Channel coding

- 3.1. Basic concepts
 - Structured redundancy
 - Coding gain
- 3.2. Block codes
 - Generator matrix
 - Decoding process
 - Cyclic codes
 - Detecting and correcting capacity
 - Hard and soft decision
- 3.3. Convolutional codes
 - Basic principles and properties
 - Maximum likelihood decoding (Viterbis algorithm)
 - Interleaving and concatenated codes

4. Channel equalization

- 4.1. Equalization basic concepts
- 4.2. Linear equalization.
 - Zero forcing
 - Minimum mean square error (MMSE)

5. Multipulse and multicarrier modulations

- 5.1. Spread spectrum modulations
 - Direct Sequence Systems (DS)
 - Frequency Hopping Systema (FH)
- 5.2. Multiple access systems

4.4. Course planning and calendar

The timetable of the course, contact hours, and laboratory sessions will be defined by the center in the academic calendar of the corresponding course.

4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=30318>