

## 30314 - Communication Theory

### Syllabus Information

**Academic year:** 2023/24

**Subject:** 30314 - Communication Theory

**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura

**Degree:** 330 - Complementos de formación Máster/Doctorado

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

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

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

**Semester:** Second semester

**Subject type:** 581 - Compulsory

438 - Compulsory

330 - ENG/Complementos de Formación

**Module:**

### 1. General information

The objective of the subject is to provide future telecommunications professionals with the most basic knowledge and methodologies to work with communication systems. Due to its basic nature, generic aspects and problems are dealt with (distortions, statistical characterization of signals and noise, etc.) and all types of systems are covered (baseband and analog as well as digital modulations), with emphasis on those of special practical relevance at present.

These approaches and objectives are aligned with some of the Sustainable Development Goals, SDGs, of the Agenda 2030 (<https://www.un.org/sustainabledevelopment/es/>), such that the acquisition of the learning results of the subject will contribute to the achievement of targets 8.2, 9.1, 9.5 and 9.c, within goals 8 and 9.

### 2. Learning results

To understand the concept of random signal, its modes of representation and characterization, its properties and its transformation through linear systems.

Know the concepts of noise, interference and distortion, as well as the basic elements of a communications system, knowing how to analyze and specify its fundamental parameters.

To know the basic concepts of baseband digital communications. Understand its limitations, mastering and knowing how to apply the concept of matched filtering as well as the characteristics of transmission through band-limited channels and the concept of intersymbolic interference.

To know the Hilbert transform and its fundamental properties, as well as the concepts of analytical signal, envelope and instantaneous frequency.

To know how to correctly use the representation of signals, systems and random bandpass processes. Know the concepts of low-pass equivalent, in-phase component and quadrature component.

Understand the concept of modulation and the reasons why it is used. To know different modulation formats both analog and digital and to know how to analyze their performance.

### 3. Syllabus

1. INTRODUCTION

2. RANDOM SIGNALS AND NOISE

3. BASEBAND TRANSMISSION SYSTEMS

3.1 The channel: transmission impairments

3.2 Digital communications basics

4. REPRESENTATION OF BANDPASS SIGNALS

4.1 Analysis tools

4.2 Signals, systems and bandpass stochastic processes

5. SHIFTED BAND TRANSMISSION SYSTEMS

5.1 Angular and amplitude analog modulations

5.2 Binary and M-ary digital modulations

## 4. Academic activities

**Participatory lectures:** 40 hours

The contents of the subject will be presented.

**Problem solving and case studies:** 10 hours

In several classroom sessions distributed throughout the course, the approach and resolution of problems will be addressed.

**Laboratory practices:** 10 hours

Five face-to-face sessions of 2 hours each will be held to reinforce the learning results.

**Supervised work:** 14 hours

A larger problem/case will be solved by computer simulation of the same.

**Study and personal work:** 70 hours

**Assessment tests:** 6 hours

## 5. Assessment system

The subject will be assessed in the **global** assessment modality by means of the following activities:

**Written tests (60%, minimum 5 out of 10)**

- **Intermediate written tests (40%):** Two tests will be given during the semester. If the grade obtained in the test(s) is lower than 5, it must be repeated on the day of the final test. A minimum average of 4 out of 10 is required for the final grade to be averaged in the final grade.
- **Final test (20%):** Examination of theoretical-practical questions to be taken on the date established in the academic calendar.

Minimum 4 out of 10.

Having reached a minimum grade of 5 in any of the intermediate written tests, it may be repeated if desired on the same day of the final exam.

**Supervised work (15%, minimum 5 out of 10)**

Analytical and critical capacity will be valued in the resolution of problems using calculation and simulation tools.

**Laboratory practicals (25%, minimum 5 out of 10)**

The assessment of the practice will be done through the requested documentation and the observation of performance and attitude in the sessions.

If the student has not passed any of these activities during the semester, they will have the opportunity to pass it by means of a global test in any of the two official calls.