

## 61071 - Antenna design and wireless systems

### Syllabus Information

**Academic year:** 2024/25

**Subject:** 61071 - Antenna design and wireless systems

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

**Degree:** 658 - Master in Telecommunications Engineering

**ECTS:** 6.0

**Year:** 1

**Semester:** Second semester

**Subject type:** Compulsory

**Module:**

### 1. General information

The purpose of this subject is to deepen in the aspects related to propagation channels, approach of standard configurations for antenna proposals in dual band, multiband and with different polarizations. To know the operating characteristics of the main families of antennas used in mobile communications systems. To evaluate the parameters describing the performance of an antenna in a mobile environment. To understand the mechanisms for improving the performance of a mobile communications system from a diversity point of view. To know the typical solutions used in satellite applications both from the point of view of on-board antennas and from the point of view of mobile receivers.

### 2. Learning results

- **HA\_01:** Ability to project, calculate and design products, processes and facilities in all areas of telecommunications engineering.
- **HA\_04:** Ability to carry out mathematical modeling, calculation and simulation in technological and engineering centers, particularly in research, development and innovation tasks in all areas related to Telecommunications Engineering and related multidisciplinary fields.
- **HA\_11:** Ability to develop radio communications systems: design of antennas, equipment and subsystems, channel modeling, link calculation and planning.
- **CP\_06:** Permanent self-learning.
- **CP\_07:** Ability to know how to communicate (orally and in writing) the conclusions - and the knowledge and ultimate reasons that support them - to specialized and non-specialized audiences in a clear and unambiguous way.

### 3. Syllabus

**Topic 0.** Presentation of the subject.

#### **BLOCK I**

- Topic 1. Propagation models.
- Topic 2. Selective channels.
- Topic 3. Diversity systems.

#### **BLOCK II**

- Topic 4. Antennas for mobile and wireless communications. Synthesis of groupings.
- Topic 5. Parameters of radiating structures in mobile environments and estimation of the correlation coefficient between antennas.
- Topic 6. Introduction to antennas for satellite communications systems.

#### **PRACTICAL SESSIONS.**

A total of 5 practical laboratory sessions will be scheduled, with a duration of two hours each.

In 3 of them, a design of antennas for portable terminals will be proposed through the use of electromagnetic simulation programs, with special care in the optimization of certain parameters of the antenna response in mobile propagation environments. The remaining 2 sessions will help the students to transfer the knowledge seen in theory sessions to a planning tool for radiocommunications systems. The planning of a system will be carried out, with special emphasis on those aspects seen in the theoretical classes.

### 4. Academic activities

- **Master classes:** 42 hours.

Theoretical and practical sessions in which the content of the subject will be explained.

- **Problems and cases:** 8 hours

Sessions in which problems and practical cases will be proposed for resolution.

- **Laboratory Practices:** 10 hours

There will be a series of practical exercises in which both software and specific equipment will be used to consolidate the set of theoretical concepts developed during the lectures.

- **Personal study and work of the student:** 87 hours.

- Evaluation tests: 3 hours for the continuous assessment and 3 hours for the global assessment.

## 5. Assessment system

### GLOBAL TEST:

The student will have a global test in each one of the calls established throughout the academic year. Dates and times will be determined by the School. The grade for this test will be obtained as follows:

A final exam (FE) consisting of a theoretical test (multi-answer, with penalty  $1/(N-1)$  where N is the number of possible answers) and a second part of problems or practical assumptions. This exam will have a weight of 70% of the overall grade (20% for the grade of the theoretical part and 50% for the part of problems or practical assumptions). A minimum grade of 4.5 points out of 10 in this test is required to pass the subject.

A set of practices to be developed in the laboratory and the resolution of the approach of a practical design that will be proposed in the problems and practical cases sessions whose weight on the overall grade is 30% (15% laboratory practices (LP), 15% practical case resolution (PCR)).

### CONTINUOUS ASSESSMENT

The student will have, throughout the term, and apart from the global tests mentioned above, the possibility of a continuous evaluation test distributed as follows.

At the end of the first block of the subject, there will be a test consisting of two parts: a theoretical one and a second part consisting of a problem. Similarly, at the end of the academic year and on the dates scheduled by EINA for continuous evaluations, a second test will be held, also consisting of two parts, a theoretical test and a problem, corresponding in the latter case to the second block of the subject.

The possible dates of the continuous evaluation tests will be notified, as far as possible, at the beginning of the academic year or in any case with sufficient time in advance. The sum of both continuous assessment tests will be equivalent to the global test mentioned above. The weighting corresponding to the two continuous evaluation tests will be the same as that established for the global tests, which the student must take if they does not pass the continuous evaluation. A 4.5 out of 10 will be necessary to add the grades of the practices (LP) practical case resolution (PCR).

In order to establish the final grade for the continuous evaluation and to define whether or not to take the global test, the deadline for the delivery of the practices will be established 5 days before the official date of the first global test defined in the calendar established by EINA.

## 6. Sustainable Development Goals

9 - Industry, Innovation and Infrastructure