

Academic Year/course: 2021/22

## 30376 - Guided transmission media

### Syllabus Information

**Academic Year:** 2021/22

**Subject:** 30376 - Guided transmission media

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

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

**ECTS:** 6.0

**Year:** 3

**Semester:** Second 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

Methodology:

1. Lectures (40 hours) laying the theoretical foundations of the course. This activity will be classroom-based and will be centered on material previously delivered to the student (or available online).
2. Problems and case studies (10 hours). Problems and cases appointed by the teacher, to be resolved by the students or the teacher himself, based on the content of the lectures. This activity will be classroom-based.
3. Laboratory (10 hours). 5 laboratory assignments of 2 hours each, to be performed in laboratories L.3.06 (Laboratorio de Alta Frecuencia) and L.3.0.2 (Laboratorio de Óptica) at the Ada Byron building. Small groups of students will carry simulations and experimental measurements using specific equipment related to the propagation of guided waves, in order to build on the knowledge acquired during the lectures. This activity will require presence at the laboratory.
4. Group assignment (16 hours). Each group, under the supervision of a teacher, will be assigned a case study related to impedance matching and the Smith chart.
5. Personal attention through academic tutoring.

#### 4.2. Learning tasks

##### **Classroom-based learning:**

Lectures and cases according to the syllabus detailed on section 4.3

##### **Laboratory:**

1. Transmission lines. (Laboratory L3.06, 3rd floor, Ada Byron).
2. Impedance measurement with an VNA (Laboratory L3.06, 3rd floor, Ada Byron).
3. CTI evaluation (Laboratory L3.06, 3rd floor, Ada Byron).

4. Rectangular waveguides. (Laboratory L3.02, 3rd floor, Ada Byron).
5. Introduction to optical fibers. (Laboratory L3.02, 3rd floor, Ada Byron).

#### Seminars

- Impedance matching

### 4.3. Syllabus

#### Unit 0. Introduction to Telecommunication systems

#### Unit 1. Transmission lines

- 1.1 Propagation on transmission lines
- 1.2 Transients on transmission lines
- 1.3 Smith chart. Transmission line circuits. Impedance matching
- 1.4 S-parameters

#### Unit 2. Waveguides

- 2.1 Propagation in waveguides
- 2.2 Rectangular waveguides
- 2.3 Cylindrical waveguides

#### Unit 3. Optical fibers

- 3.1 Total reflection. Plane and cylindrical dielectric waveguides
- 3.2 Singlemode and multimode optical fibers
- 3.3 Attenuation, dispersion, and non-linear effects in optical fibers

#### Unit 4. Introduction to optical communication systems

- 4.1 Evolution of optical communication systems
- 4.2 Optoelectronic transducers
- 4.3 Passive and active components of an optical fiber link

### 4.4. Course planning and calendar

Distribution of activities:

- Lectures and problems: four hours a week during the semester
- 5 laboratory sessions of 2 hours each, in reduced groups
- 2 seminars of 2 hours each dedicated to the Smith Chart and impedance matching

The schedule for lecture and laboratory sessions and the evaluation dates will be provided by the university before the beginning of the semester.

### 4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=30376>

The students will also have access to a **collection of lecture notes and problems**, prepared by the teachers, which will cover all the contents of this course.