

30376 - Guided transmission mediums

Syllabus Information

Academic Year: 2020/21

Subject: 30376 - Guided transmission mediums

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

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

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. Signal propagation on transitory and senoidal permanent regimes. Time domain reflectometry (Laboratory L3.06, 3rd floor, Ada Byron).
2. Theoretical and experimental study of waveguides (Laboratory L3.06, 3rd floor, Ada Byron).
3. Introduction to optical fibers. (Laboratory L3.02, 3rd floor, Ada Byron).
4. Measurement of the cut-off wavelength of an optical fiber (Laboratory L3.02, 3rd floor, Ada Byron).
5. OTDR and optical fiber splicer (Laboratory L3.02, 3rd floor, Ada Byron).

Seminars

- Introduction to the Smith Chart.
- 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 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

Basic bibliography:

- CHENG, D.K., Field and wave electromagnetics, 2nd ed., Addison-Wesley, 1989.
- KEISER, G.: Optical Fiber Communications, 3rd ed., McGraw-Hill, 1999.

Advanced bibliography:

- COLLIN, R.E.: Foundations for microwave engineering, Willey IEEE Press, December 2000.

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.