

30317 - Propagation and Transmission Media

Información del Plan Docente

Academic Year	2018/19
Subject	30317 - Propagation and Transmission Media
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	438 - Bachelor's Degree in Telecommunications Technology and Services Engineering
ECTS	9.0
Year	2
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 (54 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 (20 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 (16 hours). 8 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

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and radiating 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 Common Telecommunications Infrastructures (CTI) and their current standards and regulations. The assignment also includes assistance to seminars on the subject, possibly with the participation of guest speakers.
5. Personal attention through academic tutoring.

4.2. Learning tasks

Classroom-based learning:

Lectures and cases according to the program developed on section 5.3

Laboratory:

1. Transmission lines. Signal propagation on transitory and sinusoidal permanent regimes. Time domain reflectometry (Laboratory L3.06, 3rd floor, Ada Byron).
2. The Smith chart. Impedance matching (Laboratory L3.06, 3rd floor, Ada Byron).
3. Theoretical and experimental study of waveguides (Laboratory L3.06, 3rd floor, Ada Byron).
4. Introduction to optical fibers. (Laboratory L3.02, 3rd floor, Ada Byron).
5. Collective antenna installation according to CTI regulations. (Laboratory L3.06, 3rd floor, Ada Byron).
6. Antenna measurements: radiation diagram and polarization (Laboratory L3.06, 3rd floor, Ada Byron).
7. Propagation measurements: free space transmission, diffraction and space wave (Laboratory L3.06, 3rd floor, Ada Byron).
8. Design and electromagnetic simulation of an antenna array (Laboratory L3.06, 3rd floor, Ada Byron).

Seminars

- Introduction to Common Telecommunications Infrastructures.
- Learning to design Common Telecommunications Infrastructures according to current standards.

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. Optical fibers and optical transceivers

2.1 Propagation in waveguides

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2.2 Optical fibers

Unit 3. Fundamentals of acoustical transmission and reception

3.1 Radiation of acoustic waves and acoustic components

3.2 Electroacoustic transducers

Unit 4. Basic radio transmit and receive elements

4.1 Introduction.

4.2 Transmission parameters of antennas

4.3 Reception parameters of antennas

4.4 Transmit-receive parameters of antennas

4.5 Antenna noise temperature

Unit 5. Analysis of radiating structures and antenna arrays

5.1 Introduction to radiation

5.2 Basic antennas

5.3 Introduction to the analysis of linear antenna arrays

5.4 Linear array directivity

Unit 6. Radio wave propagation

6.1 Free space and near-earth propagation

6.2 Earth related effects

6.3 Troposphere related effects

6.4 Ionosphere related effects

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4.4. Course planning and calendar

Distribution of activities:

- Lectures and problems: six hours a week during the semester
- 8 laboratory sessions of 2 hours each, in reduced groups
- 2 seminars of 2 hours each dedicated to an introduction to Common Telecommunications Infrastructures (CTI)

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.
- CARDAMA A, y otros, Antenas, Edicions UPC, 2ª Edición, Nov 2002.

Advanced bibliography:

- COLLIN, R.E.: Foundations for microwave engineering, Willey IEEE Press, December 2000.
- KEISER, G.: Optical Fiber Communicatons, 3rd ed., McGraw-Hill, 1999.
- PUEO, B., ROMÁ, M., Electroacústica: altavoces y micrófonos, Madrid : Pearson Educación, D.L. 2003
- BALANIS, C. A. Antenna Theory Analysis and Design, John Wiley and Sons, 3rd edition.
- HERNANDO, J. M Transmisión por radio, 6ª ed. Madrid : Editorial Universitaria Ramón Areces, 2008

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.