

Access Technologies

Code: 102697
ECTS Credits: 6

Degree	Type	Year	Semester
2500898 Telecommunication Systems Engineering	OT	4	2

Contact

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Use of languages

Principal working language: catalan (cat)
Some groups entirely in English: Yes
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: Yes

Teachers

Xavier Redon Hernandez

Prerequisites

It is advisable to have completed the courses "Fundamentals of Communications" and "Digital Signal Processing".

Objectives and Contextualisation

The course focuses on the study of access technologies, from the physical layer at the modulation level to the deployment of telecommunications networks at the infrastructure level. The objectives are:

- To understand the general principles of operation of these technologies.
- To design the corresponding schemes for transmission and reception.
- To comprehend the restrictions of each technology in terms of available resources, in order to design efficient systems.
- To assess the performance in the presence of timing errors and/or multi-user interference.
- To implement techniques for channel estimation, synchronization and symbol detection.
- To know the basic characteristics of real systems, such as DVB-T/T2, GPS or LTE, and to relate their specific aspects to the theory explained during the course.
- To understand the basis of spectrum management and the standardization processes necessary to implement these networks.

Content

Part 1. Multicarrier technologies

1. Introduction to the existing multicarrier-based systems.

2. Transmission schemes.

1. Signal model and cyclic prefix.

2. Dispersive channel vs multiplicative channel.
3. Block transmission using FFT.
4. Applications: WLAN, xDSL, DVB-T/T2, LTE.

3. Reception schemes.

1. Effect of frequency and time synchronization errors.
2. Channel estimation based on pilots.
3. Synchronization based on the cyclic prefix.

4. Design of multicarrier signals.

1. Design criteria.
2. System dimensioning.
3. Allocation of resources (pilots, power) and bitloading/waterfilling algorithms.

5. Case of study: Transmission and reception of 4G LTE positioning signals.

Part 2. Access networks

6. Introduction to the existing access networks.

7. Terrestrial broadcast systems (DVB-T/T2, FM, DAB).

1. Evolution of broadcast networks and future perspectives.
2. Complete scheme of an audio-visual broadcast service.
3. Technologies used for coding, transport, distribution and reception.
4. Planning and dimensioning of a network.

8. 5G cellular systems.

1. Convergent technologies towards 5G: TETRA, IoT, telephony,...
2. 5G network model: macro-cells, small-cells, passive DAS, active DAS.
3. Management and evolution of networks: operation, maintenance, monitoring, edge computing, fog computing, virtualization.

9. Spectrum management and standardization.

1. Spectrum used in access technologies.
2. Spectrum allocation processes.
3. Standardization bodies for access technologies.