

**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.