



Subject: Wideband Wireless Communications (WWC)  
Code: 32441  
Institution: Escuela Politécnica Superior  
Degree: Master's program in Research and Innovation in Information and Communications Technologies (I<sup>2</sup>-ICT)  
Level: Master  
Type: Elective [High Performance Systems]  
Type: Elective [Biometric Security and Video Vigilance]  
ECTS: 6

## COURSE GUIDE: Wideband Wireless Communications

**Academic year:** 2013-2014

**Program:** Master's program in Research and Innovation in Information and Communications Technologies (I<sup>2</sup>-ICT)

**Center:** Escuela Politécnica Superior

**University:** Universidad Autónoma de Madrid

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## 1. ASIGNATURA / COURSE (ID)

### Comunicaciones Inalámbricas de Banda Ancha Wideband Wireless Communications (WWC)

#### 1.1. Programa / program

Máster Universitario en Investigación e Innovación en Tecnologías de la Información y las Comunicaciones (I<sup>2</sup>-TIC)

Master in Research and Innovation in Information and Communications Technologies (I<sup>2</sup>-ICT) [Officially certified]

#### 1.2. Course code

32441

#### 1.3. Course areas

- 1- High Performance Systems
- 2- Biometric Security and Video Vigilance

#### 1.4. Tipo de asignatura / Course type

Optativa [itinerario: Sistemas de Altas Prestaciones]  
Elective [itinerary: High Performance Systems]

Optativa [itinerario: Seguridad Biométrica y Videovigilancia]  
Elective [itinerary: Biometric Security and Video Vigilance]

#### 1.5. Semester

First semester

#### 1.6. Credits

6 ETCS



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## 1.7. Language of instruction

The lecture notes are in English. The lectures are mostly in Spanish. Some of the lectures and seminars can be in English.

## 1.8. Recommendations / Related subjects

- Knowledge of the basics of Wireless Communications is useful to follow the course.
- Knowledge of antennas and propagation at an introductory level is useful to follow the course.

## 1.9. Lecturers

Lectures and labs:

**Dr. Bazil Taha Ahmed** (Coordinator)  
Departamento de Ingeniería Informática  
Escuela Politécnica Superior  
Office: C-220  
Tel.: +34 91 497 6207  
e-mail: bazil.taha  
Web: <http://arantxa.ii.uam.es/~btaha/Bazil/index III.html>

## 1.10. Objetivos de la asignatura / Course objectives

En esta asignatura se introducen los sistemas de comunicaciones inalámbricas de banda ancha como: WiMAX, LTE, UWB, IEEE 802.11ac e IEEE 802.11ad. Para cada sistema, se estudia la capa física y la asignación de frecuencias. También, se estudia el modelo de la propagación para el cálculo del radio de la celda y se da la capacidad del sistema.

This subject introduces the Wideband Wireless Systems such as: WiMAX, UWB, LTE, IEEE 802.11ac e IEEE 802.11ad. For each system, the physical layer and the frequency assignment are studied. Also, the propagation model and the system capacity are given.

UNIT BY UNIT SPECIFIC OBJECTIVES	
UNIT 1.- WiMAX Systems	
1.1.	Introduce the WiMAX system
1.2.	Study the frequency assignment
1.3.	Study the physical layer of the system
1.4.	Study the adequate propagation model to calculate the cell radius



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<b>UNIT 2.- UWB systems</b>	
2.1.	Introduce the UWB system
2.2.	Study the frequency assignment and the physical layer
2.4.	Study the adequate propagation model to calculate the cell radius
<b>UNIT 3.- LTE systems</b>	
3.1.	Introduce the LTE system
3.2.	Study the frequency assignment and the physical layer
3.3.	Study the adequate propagation model to calculate the cell radius
<b>UNIT 4.- IEEE 802.11ac system</b>	
4.1.	Introduce the IEEE 802.11ac system
4.2.	Study the frequency assignment and the physical layer
4.3.	Study the adequate propagation model to calculate the cell radius
<b>UNIT 5.- IEEE 802.11ad system</b>	
5.1.	Introduce the IEEE 802.11ad system
5.2.	Study the frequency assignment and the physical layer
5.3.	Study the adequate propagation model to calculate the cell radius

## 1.11. Course contents

1. WiMAX systems
  - a. Introduction
  - b. Frequency assignment and physical layer
  - c. Cell radius calculation
2. UWB systems
  - a. Introduction
  - b. Frequency assignment and physical layer
  - c. Working radius calculation
3. LTE systems
  - a. Introduction
  - b. Frequency assignment and physical layer
  - c. Cell radius calculation
4. IEEE802.11ac systems
  - a. Introduction
  - b. Frequency assignment and physical layer
  - c. Working radius calculation
5. IEEE802.11ad systems
  - a. Introduction
  - b. Frequency assignment and physical layer
  - c. Working radius calculation



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## 1.12. Course bibliography

1. An Introduction to LTE, C. Cox, Wiley, (2012).
2. Resource Allocations in Uplink OFDMA Wireless Systems, E. E. Yaacoub and Z. Dawy, Wiley (21012).
3. Radio Technologies and Concepts for IMT-Advanced, M. Dottling, W. Moher, and A. Osseiran, Wiley (2009).
4. WiMAX, Mobile- Fi, Y. Xiao, Auerbach Publications (2008).
5. Mobile WiMAX, K-C Chen and J. r. Marca, Wiley and Sons (2008).
6. LTE for UMTS, H. Holma, and A. Toskala, Wiley (2011).
7. Multi-Gigabits Microwavw and Millimeter-wave Wireless Communications, Artech House (2010).

## 1.13. Coursework and evaluation

The course involves lectures, weekly assignments, lab assignments, a seminar presentation and two exams.

In both the ordinary and the extraordinary exam period it is necessary to have a pass grade ( $\geq 5$ ) in each of the exams to pass the course.

- In the ordinary exam period, the evaluation will be made according to the following scheme
  - 20 % Exercises and class participation
  - 20 % Lab assignments
  - 10 % Seminar presentation
  - 25 % Exam 1 [mid-term]
  - 25 % Exam 2 [end of term]

The grades of the individual parts are kept for the extraordinary exam period.

- In case of a fail grade in the ordinary exam period, in the extraordinary exam period, the student will maintain the notes due to the exercises and class participation, lab assignments and seminar presentation.
- 50 % written exam [mandatory]