

<b>Program</b>	<b>09TT- Engineering in Telecommunication Technologies and Services</b>
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<b>Course number and name</b>	
<b>Number</b>	95000055
<b>Name</b>	Radio Networks and Services Redes y Servicios Radio
<b>Semester</b>	Y4-S8

<b>Credits and contact hours</b>	
<b>ECTS Credits</b>	5
<b>Contact hours</b>	50

<b>Coordinator's name</b>	Carlos Miguel Nieto
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<b>Specific course information</b>
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**Description of course content**

The general objectives of the course are:

- Knowing the basic technics in radio networks, such as multiple access and link control.
- Knowing the characteristics and capabilities of the most relevant radio data networks: local, personal, and wide area both terrestrial and satellite.
- Knowing the integration between radio and other networks and characterizing the impact of radio networks in the End-to-End Quality of Service.
- Applying Tele-traffic to radio networks.

**List of topics to be covered**

1. Basic techniques in radio networks.
  - 1.1. Introduction, scope and evolution of radio networks.
  - 1.2. Multiple Access Techniques (MAC): Random Access (RA). MF-TDMA, CDMA, OFDMA. Radio link optimization: Basics of link control techniques (LLC). HARQ. MIMO.
2. Wireless Local Area Networks (WLAN).
  - 2.1. Evolution and technology in Wi-Fi networks.
  - 2.2 Sizing, performance and applications.
3. Personal Area Networks (PAN) and Sensor Networks.
  - 3.1. Evolution and technology.
  - 3.2. Bluetooth
  - 3.3. Profiles and applications.
4. Terrestrial Radio Access Networks.
  - 4.1. Terrestrial radio access evolution: WiMAX, 3GPP.
  - 4.2. 4<sup>th</sup> generation access: Radio resources and capacity. LTE radio: MAC, RLC and RRC.
5. Satellite Access Networks.
  - 5.1. Architecture and services in satellite networks.
  - 5.2. Satellite access techniques.
  - 5.3. DVB-S2 and DVB-RCS (2) based data networks.
6. Multicast and End to End QoS.

6.1. IP Multicast in radio networks. 6.2. Delay/Disruption Tolerant networking (DTN) 6.3. Impact of radio networks in E-to-E QoS. TCP in radio networks.		
7. Radio Services: Location-based services, Mobile TV... Integration in open architectures.		
<b>Prerequisites or co-requisites</b>		
None, but it will be assumed that students have knowledge in computer networks.		
<b>Course category in the program</b>		
<input type="checkbox"/> R (required)	<input checked="" type="checkbox"/> E (elective)	<input type="checkbox"/> SE (selective elective)

<b>Specific goals for the course</b>
<b>Specific outcomes of instruction</b>
RA83 - Ability to design, deploy and manage network architectures and services, access networks, core and private, both fixed and mobile environments, using analytical tools and network dimensioning.
RA84 - Ability to apply technical quality of service (QoS) and traffic engineering (MPLS ...) to adapt the requirements of different traffic flows to the services provided by the network.
RA88 - Ability to specify, program, validate and optimize communication protocols and interfaces at different levels of protocols, both the core network and end to end.
RA91 - Ability to track technological innovation of transmission systems, switching and process to improve the networks and services.
<b>Student outcomes addressed by the course</b>
CE-TL2, CE-TL4, CE-TL5, CE-TL6, CG2, CG3, CG5, CG6

<b>Bibliography and supplemental materials</b>
<ul style="list-style-type: none"> <li>• Labiod, H. Wi-Fi, Bluetooth, Zigbee And Wimax. Springer Verlag 2007, ISBN13: 9781402053962.</li> <li>• WCDMA for UMTS: HSPA Evolution and LTE, 5th Edition. Harri Holma; Antti Toskala. 2010</li> <li>• 4G: LTE/LTE-Advanced for Mobile Broadband, 2nd Edition, Erik Dahlman; Stefan Parkvall; Johan Skold, Academic Press, October 7, 2013</li> <li>• Mobile WiMAX, Sassan Ahmadi, Academic Press, November 4, 2010</li> <li>• Satellite Communication Systems. Systems, Techniques and Technology. 5th Ed. G. Maral, M. Bousquet. 2009. Chapter: Satellite Networks.</li> </ul>

<b>Teaching methodology</b>			
<input checked="" type="checkbox"/> lectures	<input checked="" type="checkbox"/> problem solving sessions	<input type="checkbox"/> collaborative actions	<input type="checkbox"/> laboratory sessions
<b>Other:</b>			