

230054 - RCOMSISTEL - Radio Communications

Coordinating unit:	230 - ETSETB - Barcelona School of Telecommunications Engineering
Teaching unit:	739 - TSC - Department of Signal Theory and Communications
Academic year:	2019
Degree:	BACHELOR'S DEGREE IN TELECOMMUNICATIONS SYSTEMS ENGINEERING (Syllabus 2010). (Teaching unit Compulsory) BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Teaching unit Optional)
ECTS credits:	6
Teaching languages:	Catalan, Spanish

Teaching staff

Coordinator:	Perez Romero, Jorge
Others:	Casadevall Palacio, Fernando-Jose Perez Romero, Jorge Sallent Roig, Jose Oriol

Degree competences to which the subject contributes

Generical:

12 CPE N3. They will be able to identify, formulate and solve engineering problems in the ICC field and will know how to develop a method for analysing and solving problems that is systematic, critical and creative.

Teaching methodology

Lectures
Exercises and problems
Short answer tests (Control)
Long answer test (Final Exam)

Learning objectives of the subject

Objectives:

- Study the fundamentals of the communication systems that make use of the radioelectric spectrum as a support for the communication
- Study, design and evaluation of mobile communications systems, wireless systems and fixed radio links.

Result of the learning stage:

- To be able of designing and evaluating the techniques that constitute the basis for networks, services and telecommunication applications in mobile environments, wireless systems and radio link communications, from the perspective of the communications.
- To be able to identify and model complex radiocommunications systems.
- To understand the management process of the radioelectrical spectrum and the frequency allocation
- To carry out quantitative and qualitative analysis and to evaluate the influence of approximations
- To apply the acquired competence to carry out a task in an autonomous way
- To identify the need for continuous learning and to develop an own strategy to carry it out.

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Study load

Total learning time: 150h	Hours large group:	65h	43.33%
	Self study:	85h	56.67%

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Content

<p>1.- Introduction</p>	<p>Learning time: 4h Theory classes: 2h Self study : 2h</p>
<p>Description: 1.1.- Definition 1.2.- Scope 1.3.- Mobile communications systems and technologies</p>	
<p>2.- Radio channel characterisation</p>	<p>Learning time: 23h Theory classes: 10h Self study : 13h</p>
<p>Description: 2.1.- Introduction 2.2.- Propagation in mobile environments 2.2.1.- Propagation losses 2.2.2.- Slow fading 2.2.3.- Multipath propagation 2.2.3.1.- Proximity echoes: Fast fading 2.2.3.2.- Distant echoes: distortion 2.2.4.- Second order statistics 2.2.5.- Measurements 2.3.- Propagación in fixed radio links 2.3.1.- Propagation losses 2.3.1.1.- Diffraction 2.3.1.2.- Refraction 2.3.1.3.- Antenna height 2.3.2.- Attenuation due to rain 2.3.3.- Fading due to refraction 2.4.- Noise 2.5.- Interference</p>	

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<p>3.- Radio link budget</p>	<p>Learning time: 37h Theory classes: 16h Self study : 21h</p>
<p>Description:</p> <ul style="list-style-type: none"> 3.1.- Quality objectives 3.2.- Performance model of the radio channel <ul style="list-style-type: none"> 3.2.1.- Gaussian channel 3.2.2.- Rayleigh channel 3.3.- Power budget <ul style="list-style-type: none"> 3.3.1.- Mobile systems 3.3.2.- Fixed radio links 3.4.- Radio engineering techniques <ul style="list-style-type: none"> 3.4.1.- Power control 3.4.2.- Equalisation 3.4.3.- Channel coding and interleaving 3.4.4.- Adaptive coding and modulation 3.4.5.- Diversity 3.4.6.- Spatial multiplexing 	
<p>4.- Mobile radio access</p>	<p>Learning time: 40h Theory classes: 17h Self study : 23h</p>
<p>Description:</p> <ul style="list-style-type: none"> 4.1.- Introduction 4.2.- Multiple access techniques <ul style="list-style-type: none"> 4.2.1.- FDMA 4.2.2.- TDMA 4.2.3.- CDMA 4.2.4.- OFDMA 4.3.- Duplexing techniques <ul style="list-style-type: none"> 4.3.1.- FDD 4.3.2.- TDD 4.4.- Radio access management <ul style="list-style-type: none"> 4.4.1.- TDMA access 4.4.2.- CDMA access 4.4.3.- OFDMA access 	

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<p>5.- Cellular systems</p>	<p>Learning time: 46h Theory classes: 20h Self study : 26h</p>
<p>Description:</p> <ul style="list-style-type: none"> 5.1.- Model of a cellular system 5.2.- Control and management of cellular systems 5.3.- Dimensioning of a cellular system 5.4.- Dimensioning of FDMA/TDMA cellular systems <ul style="list-style-type: none"> 5.4.1.- Deployment of resources 5.4.2.- Traffic characterisation 5.4.3.- Dimensioning process 5.5.- Dimensioning of CDMA cellular systems <ul style="list-style-type: none"> 5.5.1.- Deployment of resources 5.5.2.- Traffic characterisation 5.5.3.- Dimensioning process 5.6.- Multi-layer cellular structures 5.7.- Radio resource management in cellular systems <ul style="list-style-type: none"> 5.7.1.- FDMA/TDMA systems 5.7.2.- CDMA systems 5.7.3.- OFDMA systems 	

Qualification system

- 60% Final Exam
- 40% Control

Bibliography

Basic:

Sallent Roig, Oriol; Pérez Romero, Jordi. Fundamentos de diseño y gestión de sistemas de comunicaciones móviles celulares [on line]. Barcelona: Iniciativa Digital Politécnica UPC, 2014 [Consultation: 02/10/2014]. Available on: <<http://hdl.handle.net/2099.3/36630>>. ISBN 9788498804812.

Complementary:

Hernando Rábanos, J.M.; Riera Salís, J.M.; Mendo Tomás, L. Transmisión por radio. 7a ed. Madrid: Centro de Estudios Ramón Areces, 2013. ISBN 9788499611068.

Others resources:

- Radiocommunications: Slides
- Radiocommunications: Exercises
- Radiocommunications: Problems