

230612 - AMC - Advanced Mobile Communications

Coordinating unit:	230 - ETSETB - Barcelona School of Telecommunications Engineering
Teaching unit:	739 - TSC - Department of Signal Theory and Communications
Academic year:	2019
Degree:	MASTER'S DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 2013). (Teaching unit Optional) MASTER'S DEGREE IN INFORMATION AND COMMUNICATION TECHNOLOGIES (Syllabus 2009). (Teaching unit Optional)
ECTS credits:	5
Teaching languages:	English

Teaching staff

Coordinator:	Jordi Pérez Romero
Others:	Ramon Ferrús, Jordi Pérez Romero, Ferran Casadevall

Prior skills

Basic knowledge about radiocommunications.

Degree competences to which the subject contributes

Specific:

1. Ability to develop radio-communication systems: antennas design, equipment and subsystems, channel modeling, link dimensioning and planning.
2. Ability to implement wired/wireless systems, in both fix and mobile communication environments.

Transversal:

3. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.
4. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

Teaching methodology

- Lectures
- Group work
- Oral presentations
- Mid-term exam
- Final exam

Learning objectives of the subject

Provide a system view of mobile communications networks through the description and analysis of the UMTS, LTE and LTE-Advanced networks.

Learning results of the subject:

- Ability to analyse, model and design and implement the newest architectures, protocols and communication interfaces for mobile communication systems.
- Ability to analyse, model and apply advanced mobile communication techniques.



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Study load

Total learning time: 125h	Hours large group:	39h	31.20%
	Hours medium group:	0h	0.00%
	Hours small group:	0h	0.00%
	Guided activities:	0h	0.00%
	Self study:	86h	68.80%

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Content

<p>1.- Introduction</p>	<p>Learning time: 6h Theory classes: 2h Self study : 4h</p>
<p>Description: 1.1.- Mobile Communications technology evolution 1.2.- Standardisation process 1.3.- Drivers to increase network capacity</p>	
<p>2.- 3G technologies (UMTS/HSPA/HSPA+)</p>	<p>Learning time: 45h Theory classes: 14h Self study : 31h</p>
<p>Description: 2.1.- UMTS standardisation 2.2.- UMTS architecture 2.2.1.- UMTS Radio Access Network (UTRAN) 2.3.- UMTS R99 Radio Interface 2.3.1.- Basic features 2.3.2.- Protocol stack 2.3.3.- Physical layer 2.3.4.- Examples of channel configurations 2.3.5.- Basic procedures 2.4.- HSPA 2.4.1.- HSDPA 2.4.2.- HSUPA 2.4.3.- Comparison HSDPA vs HSUPA 2.5.- HSPA+ 2.5.1.- Evolution of HSPA 2.5.2.- Main characteristics 2.5.3.- HSPA+ features</p>	

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3.- Long Term Evolution (LTE)	Learning time: 52h Theory classes: 16h Self study : 36h
<p>Description:</p> <ul style="list-style-type: none">3.1.- LTE standardisation3.2.- LTE architecture<ul style="list-style-type: none">3.2.1.- Evolved Packet System (EPS)3.2.2.- User Equipment (UE)3.2.3.- E-UTRAN3.2.4.- Evolved Packet Core (EPC)3.3.- LTE procedures<ul style="list-style-type: none">3.3.1.- Session management3.3.2.- Mobility management3.3.3.- Signalling flows3.4.- LTE radio interface<ul style="list-style-type: none">3.4.1.- Physical layer3.4.2.- Logical, transport and physical channels3.4.3.- DL Physical channels3.4.4.- UL Physical channels3.4.5.- Voice over LTE (VoLTE)3.4.6.- Procedures3.5.- MBMS<ul style="list-style-type: none">3.5.1.- Concept3.5.2.- Single Frequency Network (SFN)3.5.3.- MBMS Areas3.5.4.- MBMS Architecture3.5.5.- Logical, transport and physical channels3.5.6.- Physical resources used in MBSFN	

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<p>4.- LTE-Advanced (LTE-A), LTE-A Pro and way towards 5G</p>	<p>Learning time: 22h Theory classes: 7h Self study : 15h</p>
<p>Description:</p> <ul style="list-style-type: none"> 4.1.- LTE Advanced <ul style="list-style-type: none"> 4.1.1.- Introduction 4.1.2.- Carrier Aggregation 4.1.3.- Enhanced multi-antenna techniques 4.1.4.- CoMP 4.1.5.- Relaying 4.1.6.- Heterogeneous Networks 4.2.- LTE Advanced Pro <ul style="list-style-type: none"> 4.2.1.- Introduction 4.2.2.- Massive Carrier Aggregation 4.2.3.- Dual Connectivity 4.2.4.- Licensed-Assisted Access (LAA) 4.2.5.- LTE-Wi-Fi Aggregation (LWA) 4.2.6.- Support for IoT 4.2.7.- Device-to-Device (D2D) communications 4.3.- Towards 5G <ul style="list-style-type: none"> 4.3.1.- Use cases 4.3.2.- Requirements 4.3.3.- Technologies 4.3.4.- Organisations 	

Qualification system

Group work (written report and oral presentation): 25%
Mid-term exam: 30%
Final exam: 45%

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Bibliography

Basic:

Dahlman, E.; Parkvall, S.; Skold, J.; Beming, P. 3G evolution: HSPA and LTE for mobile broadband. 2nd ed. Amsterdam: Elsevier, 2008. ISBN 9780123745385.

Agustí, R. [et al.]. LTE: nuevas tendencias en comunicaciones móviles. [S.l.]: Fundación Vodafone, 2010. ISBN 8493474045.

Holma, H.; Toskala, A. (eds.). WCDMA for UMTS - HSPA evolution and LTE. 5th ed. Chichester: John Wiley & Sons, 2010. ISBN 9780470686461.

Holma, H.; Toskala, A. (eds.). LTE for UMTS: evolution to LTE-Advanced. Chichester, UK: John Wiley and Sons, 2011. ISBN 9780470660003.

Complementary:

Olsson, M. [et al.]. SAE and the evolved packet core: driving the mobile broadband revolution. Oxford: Academic Press, 2009. ISBN 9780123748263.

Holma, H.; Toskala, A. HSDPA/HSUPA for UMTS: high speed radio access for mobile communications. Chichester: John Wiley & Sons, 2006. ISBN 0470018844.

Sallent, O.; Pérez, J. Fundamentos de diseño y gestión de sistemas de comunicaciones móviles celulares [on line]. Barcelona: Universitat Politècnica de Catalunya. Iniciativa Digital Politècnica, 2014 [Consultation: 10/10/2018]. Available on: <<http://hdl.handle.net/2099.3/36630>>. ISBN 9788498804812.

Others resources:

Collection of slides