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: 2018
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.
### Study load

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Hours large group: 39h</th>
<th>31.20%</th>
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<tbody>
<tr>
<td>Hours medium group: 0h</td>
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<td>Hours small group: 0h</td>
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<td>Guided activities: 0h</td>
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<tr>
<td>Self study: 86h</td>
<td>68.80%</td>
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## Content

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<tr>
<th>1.- Introduction</th>
<th><strong>Learning time:</strong> 6h</th>
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<tr>
<td></td>
<td>Theory classes: 2h</td>
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<td>Self study : 4h</td>
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**Description:**
1.1.- Mobile Communications technology evolution  
1.2.- Standardisation process  
1.3.- Drivers to increase network capacity

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<tr>
<th>2.- 3G technologies (UMTS/ HSPA/ HSPA+)</th>
<th><strong>Learning time:</strong> 45h</th>
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<tr>
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<td>Theory classes: 14h</td>
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<td>Self study : 31h</td>
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**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
### 3.- Long Term Evolution (LTE)

**Description:**
3.1.- LTE standardisation  
3.2.- LTE architecture  
3.2.1.- Evolved Packet System (EPS)  
3.2.2.- User Equipment (UE)  
3.2.3.- E-UTRAN  
3.2.4.- Evolved Packet Core (EPC)  
3.3.- LTE procedures  
3.3.1.- Session management  
3.3.2.- Mobility management  
3.3.3.- Signalling flows  
3.4.- LTE radio interface  
3.4.1.- Physical layer  
3.4.2.- Logical, transport and physical channels  
3.4.3.- DL Physical channels  
3.4.4.- UL Physical channels  
3.4.5.- Voice over LTE (VoLTE)  
3.4.6.- Procedures  
3.5.- MBMS  
3.5.1.- Concept  
3.5.2.- Single Frequency Network (SFN)  
3.5.3.- MBMS Areas  
3.5.4.- MBMS Architecture  
3.5.5.- Logical, transport and physical channels  
3.5.6.- Physical resources used in MBSFN

**Learning time:** 52h  
Theory classes: 16h  
Self study: 36h
4.- LTE-Advanced (LTE-A), LTE-A Pro and way towards 5G

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<td>4.1.- LTE Advanced</td>
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<td>4.1.2.- Carrier Aggregation</td>
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<td>4.1.3.- Enhanced multi-antenna techniques</td>
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<td>4.1.4.- CoMP</td>
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<td>4.1.5.- Relaying</td>
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<td>4.1.6.- Heterogeneous Networks</td>
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<td>4.2.- LTE Advanced Pro</td>
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<td>4.2.1.- Introduction</td>
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<td>4.2.2.- Massive Carrier Aggregation</td>
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<td>4.2.4.- Licensed-Assisted Access (LAA)</td>
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<td>4.2.7.- Device-to-Device (D2D) communications</td>
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<td>4.3.- Towards 5G</td>
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<td>4.3.1.- Use cases</td>
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<td>4.3.4.- Organisations</td>
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Learning time: 22h
- Theory classes: 7h
- Self study: 15h

Qualification system

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

Basic:


Complementary:


Others resources:
Collection of slides