230709 - 5GMCS - 5G Mobile Communications Systems

Degree competences to which the subject contributes

Specific:
- CE2. Ability to develop radio-communication systems: antennas design, equipment and subsystems, channel modeling, link dimensioning and planning.

Transversal:
- CT4. 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.
- CT5. 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.

Learning objectives of the subject

- Present the mobile communications systems that compose the so-called 5th Generation (5G) resulting from the evolution of LTE technology and the integration of the new radio interface (5G New Radio).
- Analyze the characteristics and functionalities of 5G systems to provide services to new application domains, such as Internet of Things, vehicular communications, etc.

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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(Note: Until the course 2017/18 this subject was offered under the title “Advanced Mobile Communications” and it has evolved to incorporate the 5G systems.)

<table>
<thead>
<tr>
<th>Study load</th>
<th>Hours large group</th>
<th>Self study</th>
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<tbody>
<tr>
<td><strong>Total learning time</strong>: 125h</td>
<td>39h</td>
<td>86h</td>
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<td>31.20%</td>
<td>68.80%</td>
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## Content

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Learning time:</th>
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<tbody>
<tr>
<td><strong>1.- Introduction</strong></td>
<td></td>
<td>8h</td>
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<tr>
<td><strong>2.- Long Term Evolution (LTE)</strong></td>
<td></td>
<td>46h</td>
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<tr>
<td><strong>3.- LTE evolution towards 5G</strong></td>
<td></td>
<td>22h</td>
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<tr>
<td><strong>4.- 5G system</strong></td>
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<td>22h</td>
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### 1.1.- Mobile Communications technology evolution

### 1.2.- Drivers to increase network capacity

### 1.3.- 5G requirements and use cases

### 1.4.- Standardisation process

### 2.1.- Architecture

### 2.2.- Procedures

### 2.3.- Radio interface

### 2.4.- LTE-Advanced (LTE-A)

### 3.1.- LTE Advanced Pro

### 3.2.- Support for IoT

### 3.3.- Vehicular communications (V2X)

### 3.4.- eMBMS

### 4.1.- Reference architecture

### 4.2.- Network functions and interfaces of the 5G Core

### 4.3.- NG-RAN

### 4.4.- QoS model and procedures

### 4.5.- Support for Network Slicing

Learning time:
- Theory classes: 3h
- Self study : 5h
- Theory classes: 14h
- Self study : 32h
- Theory classes: 7h
- Self study : 15h
- Theory classes: 7h
- Self study : 15h
5.- 5G New Radio (5G NR)  

**Description:**
- 5.1. Radio interface protocol stack
- 5.2. Physical layer characteristics
- 5.3. Logical, transport and physical channels
- 5.4. Procedures

**Learning time:** 27h  
Theory classes: 8h  
Self study: 19h

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**Qualification system**

Team work: 25%  
Mid-term exam: 30%  
Final exam: 45%

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**Bibliography**

**Basic:**

**Complementary:**

**Others resources:**
- Slides of the subject