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.

Learning objectives of the subject

The objective of this course is to train students in aspects of functionality, size and service of mobile cellular networks. First the basic concepts that enable such networks to operate. Then delve into the strategies used to perform the transfer functions of search and tracking of mobile terminals.

The second part of the course focuses on the operation of transport and access networks that make up the mobile communication networks. Explain its elements, its signs and how to dimensionate them.

Learning outcomes:

- It has capacity to build, operate and manage networks, services, processes and telecommunications applications from the point of view of telematic services.
- Is able to apply management techniques, signaling, switching, routing and routing networks in fixed and mobile environments.
- You can analyse using traffic engineering (graph theory, queuing theory and teletraffic).
- Are you familiar with the protocols and communication interfaces at different levels of network architecture and is able to describe them, program them, validate them and optimize them.
- Meet the technological progress of transmission, switching and process to improve the networks and online services.
- Plan and agreed objectives, operating rules, responsibilities, agenda and procedure for reviewing the work.
- Identifies, models and poses from open situations. Explore and apply alternatives for their resolution. Use approaches.
<table>
<thead>
<tr>
<th>Study load</th>
<th>Total learning time: 150h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours large group: 65h</td>
</tr>
<tr>
<td></td>
<td>Self study: 85h</td>
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<tr>
<td></td>
<td>43.33%</td>
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<tr>
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<td>56.67%</td>
</tr>
</tbody>
</table>
# Content

<table>
<thead>
<tr>
<th>Item 1. Basic functions of a mobile network.</th>
<th>Learning time: 11h 15m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Theory classes: 5h 20m</td>
</tr>
<tr>
<td>Choosing base station, access, configuration, communication and monitoring.</td>
<td>Self study : 5h 55m</td>
</tr>
<tr>
<td>Performance parameters in wireless systems.</td>
<td></td>
</tr>
<tr>
<td>Basic services of a mobile system: based circuit-mode and packet-based mode.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 2. Handover analysis techniques.</th>
<th>Learning time: 11h 15m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Theory classes: 5h 20m</td>
</tr>
<tr>
<td>Description and analysis of the technical handover of cellular mobile systems</td>
<td>Self study : 5h 55m</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 3. Paging strategies.</th>
<th>Learning time: 11h 15m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Theory classes: 5h 20m</td>
</tr>
<tr>
<td>Search for static routes.</td>
<td>Self study : 5h 55m</td>
</tr>
<tr>
<td>Looking for dynamic areas.</td>
<td></td>
</tr>
<tr>
<td>Evaluation of delay.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 4. Localization.</th>
<th>Learning time: 10h 35m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Theory classes: 4h 40m</td>
</tr>
<tr>
<td>Localization techniques.</td>
<td>Self study : 5h 55m</td>
</tr>
<tr>
<td>Combined use of location and searches.</td>
<td></td>
</tr>
</tbody>
</table>
### Item 5. Access network.

**Description:**
- Evolution.
- Types of information: signaling, synchronization, control and user.
- Transport systems.
- Dimensioning of the network: services and services not elastic.

**Learning time:** 10h 35m
- Theory classes: 4h 40m
- Self study: 5h 55m

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### Item 6. Backbone.

**Description:**
- Evolution.
- Switching elements.
- Elements of control: signaling network.
- Elements of building services: IMS.
- Interconnection networks.
- Sizing of elements and interfaces.

**Learning time:** 10h 35m
- Theory classes: 4h 40m
- Self study: 5h 55m

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### Topic 7. 4G Systems

**Description:**
- LTE radio interface
- Physical channels
- Control channels
- Broadcast
- Locking
- Access
- Paging
- Capacity calculation
- Network elements
- Elements and topology
- Roles and procedures
- Resource allocation
- Handover
- Location update
- Voice Support

**Learning time:** 31h 45m
- Theory classes: 14h
- Self study: 17h 45m
230161 - SSCMOB - Support Systems for Mobile Communications

**Topic 9. Security**

**Description:**
Security
Mechanisms and procedure for GSM
Security risks
Mechanisms and procedure for UMTS
Security risks
Mechanisms and procedure for LTE
Security risks

**Learning time:** 21h 10m
- Theory classes: 9h 20m
- Self study: 11h 50m

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**Topic 9. Evolution: 4G+ and 5G**

**Description:**
Evolution: 4G+ and 5G
Improvements over 4G: Carrier aggregation. Support unlicensed bands...
5G: New radio interface, network slicing...

**Learning time:** 10h 35m
- Theory classes: 4h 40m
- Self study: 5h 55m

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**Qualification system**

First intermediate exam (IE_1) (50%)
Second intermediate exam (IE_2) (50%)
Final exam (FE) (100%). In case you fail the continuous evaluation

**Bibliography**

**Basic:**

**Others resources:**
- Hyperlink
  - Atenea