230161 - SSCMOB - Support Systems for Mobile Communications

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering
Teaching unit: 744 - ENTEL - Department of Network Engineering
Academic year: 2019
Degree: BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Teaching unit Optional)
ECTS credits: 6
Teaching languages: Catalan

Teaching staff

Coordinator: Calveras Auge, Ana M.
Others: Calveras Auge, Ana M.
Paradells Aspas, Jose

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

Application class
lectures
Group work (learning)
Individual (learning)
Evidence of long answer (Control)
Evidence of long answer (Final Exam)

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.
## Study load

<table>
<thead>
<tr>
<th></th>
<th>Hours large group:</th>
<th>Self study:</th>
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</thead>
<tbody>
<tr>
<td><strong>Total learning time:</strong></td>
<td>65h</td>
<td>85h</td>
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<tr>
<td><strong>43.33%</strong></td>
<td>56.67%</td>
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# Content

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

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

<table>
<thead>
<tr>
<th>Item 3. Paging strategies.</th>
<th>Learning time: 11h 15m</th>
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<tbody>
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**Description:**
Search for static routes.
Looking for dynamic areas.
Evaluation of delay.

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

### 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

### 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
### Topic 9. Security

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Security</td>
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<tr>
<td>Mechanisms and procedure for GSM</td>
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<tr>
<td>Security risks</td>
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<tr>
<td>Mechanisms and procedure for UMTS</td>
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<tr>
<td>Security risks</td>
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<tr>
<td>Mechanisms and procedure for LTE</td>
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<td>Security risks</td>
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<table>
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<th>Learning time: 21h 10m</th>
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<tbody>
<tr>
<td>Theory classes: 9h 20m</td>
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<tr>
<td>Self study: 11h 50m</td>
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### Topic 9. Evolution: 4G+ and 5G

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<tbody>
<tr>
<td>Evolution: 4G+ and 5G</td>
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<tr>
<td>Improvements over 4G: Carrier aggregation. Support unlicensed bands,..</td>
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<tr>
<td>5G: New radio interface, network slicing,..</td>
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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

Atenea