230649 - TSYS - Telecommunications Systems

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 Compulsory)
ECTS credits: 5
Teaching languages: English

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. Ability to integrate Telecommunication Engineering technologies and systems, as a generalist, and in broader and multidisciplinary contexts, such as bioengineering, photovoltaic conversion, nanotechnology and telemedicine.

4. 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.
5. 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’s work
- Short questions/test (Control and Final exams)

Learning objectives of the subject

Learning objectives of the subject:

The aim of this course is to provide a holistic and high-level approach to the Telecommunication Systems, including their architectures, central functionalities and main technological characteristics. Within this framework, the course will firstly present the basic concepts related to regulation, standardization and services, thus establishing the context for the different Telecommunication Systems that will be subsequently addressed. Then, each one of the key different Telecommunication Systems will be introduced, with the goal of describing and differentiating its main characteristics and capabilities, including the involved technologies, the internetworking level when applicable, as well as their social-economics trends.

After completion of the course students should be able to identifying each one of the main involved technologies and its target objectives within a complete map of existing Telecommunication Systems. Finally, high-level case studies of the different plausible and proper scenarios will be analyzed /studied/ evaluated by means of group’s work.
## Study load

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

<table>
<thead>
<tr>
<th>1. Introduction to Telecommunication Systems and Services</th>
<th><strong>Learning time:</strong> 7h 30m</th>
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<tbody>
<tr>
<td>Description:</td>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td>- Telecommunication Systems concept</td>
<td>Self study : 4h 30m</td>
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<tr>
<td>- Telecommunication Systems and Services</td>
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<tr>
<td>- Telecommunication Systems and services Taxonomy</td>
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<tr>
<td>- Market models and stakeholders (service and infrastructure providers, regulators, manufacturers, etc.)</td>
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<tr>
<th>2. Regulatory and Standardization Framework</th>
<th><strong>Learning time:</strong> 7h 30m</th>
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<tbody>
<tr>
<td>Description:</td>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td>- Standardization Bodies (ITU-T, ETSI, 3GPP, IEEE SA, etc.)</td>
<td>Self study : 4h 30m</td>
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<tr>
<td>- Regulatory Framework and regulators (ITU-R RR, CEPT ECC, etc.)</td>
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<tr>
<th>3. PSTN and INTERNET: Evolution</th>
<th><strong>Learning time:</strong> 9h</th>
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<tbody>
<tr>
<td>Description:</td>
<td>Theory classes: 3h</td>
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<tr>
<td>- Public Switched Telephone Network</td>
<td>Self study : 6h</td>
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<tr>
<td>- Signaling Systems: CAS and CCS</td>
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<tr>
<td>- PSDN: Packet Switching Data Networks and ISDN</td>
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<tr>
<td>- INTERNET</td>
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<td>- Signaling: SIP Protocol</td>
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<tr>
<th>4. Mobile Communications</th>
<th><strong>Learning time:</strong> 25h</th>
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<tr>
<td>Description:</td>
<td>Theory classes: 10h</td>
</tr>
<tr>
<td>- Introduction</td>
<td>Self study : 15h</td>
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<tr>
<td>- 2G, 3G, 4G and 5G</td>
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<tr>
<td>- Professional / Private Mobile Radio (PMR) systems</td>
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<tr>
<td>- Aeronautical systems</td>
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### 5. Radio Links

**Description:**
- Introduction
- Frequency Planning
- Link Budget
- Quality and Availability
- Radio Link Design

**Learning time:** 15h
- Theory classes: 5h
- Self study: 10h

### 6. Satellites

**Description:**
- Introduction
- Orbits
- Propagation and link budget
- Frequency bands and multiple access
- Satellite systems architecture
- VSAT: A Case Study

**Learning time:** 15h
- Theory classes: 5h
- Self study: 10h

### 7. Broadband Access Systems and Technologies

**Description:**
- Introduction
- X-DSL Systems
- Fiber to the X (FTTX) Concept
- Cable Modem (HFC Networks)
- Power Line Communications
- WiMAX
- Radio over Fibre

**Learning time:** 12h
- Theory classes: 4h
- Self study: 8h
### 8. NEXT GENERATION NETWORKS: NGN

<table>
<thead>
<tr>
<th>Description:</th>
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| -Introduction NGN  
-Architecture NGN  
-IP multimedia subsystem: IMS  
-IMS SIP  
-IMS: Further Considerations and Some Examples |

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<th>Learning time:</th>
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| 9h  
Theory classes: 3h  
Self study: 6h |

### 9. Use Cases Presentation

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<th>Description:</th>
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| -Presentation of different Telecommunication Systems use cases  
-Discussion |

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<th>Learning time:</th>
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| 25h  
Theory classes: 3h  
Self study: 22h |

### Qualification system

- Final Examination  
- Partial examination and Controls  
- Group work  
- Individual assessments (Attendance/participation in class, etc)
Bibliography

**Complementary:**


**Others resources:**

Ramon Agusti, Course Slides, ETSETB, ATENEA