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: 2019
Degree: MASTER'S DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 2013). (Teaching unit Compulsory)
MASTER'S DEGREE IN ADVANCED TELECOMMUNICATION TECHNOLOGIES (Syllabus 2019). (Teaching unit Optional)
ECTS credits: 5  Teaching languages: English

Teaching staff
Coordinator: RAMÓN AGUSTÍ
Others: RAMÓN AGUSTÍ, FERRAN CASADEVALL, RAMON FERRÚS

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.

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.

Transversal:
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></td>
<td>Hours small group:</td>
<td>0h</td>
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<td></td>
<td>Guided activities:</td>
<td>0h</td>
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<td>Self study:</td>
<td>86h</td>
<td>68.80%</td>
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<table>
<thead>
<tr>
<th>Content</th>
<th>Learning time: 7h 30m</th>
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| 1. Introduction to Telecommunication Systems and Services | Theory classes: 3h  
Self study : 4h 30m |

**Description:**
- Telecommunication Systems concept
- Telecommunication Systems and Services
- Telecommunication Systems and services Taxonomy
- Market models and stakeholders (service and infrastructure providers, regulators, manufacturers, etc.)

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<th>Content</th>
<th>Learning time: 7h 30m</th>
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| 2. Regulatory and Standardization Framework | Theory classes: 3h  
Self study : 4h 30m |

**Description:**
- Standardization Bodies (ITU-T, ETSI, 3GPP, IEEE SA, etc.)
- Regulatory Framework and regulators (ITU-R RR, CEPT ECC, etc.)

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<th>Content</th>
<th>Learning time: 9h</th>
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| 3. PSTN and INTERNET: Evolution | Theory classes: 3h  
Self study : 6h |

**Description:**
- Public Switched Telephone Network
- Signaling Systems :CAS and CCS
- PSDN: Packet Switching Data Networks and ISDN
- INTERNET
- Signaling: SIP Protocol

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<th>Content</th>
<th>Learning time: 25h</th>
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| 4. Mobile Communications | Theory classes: 10h  
Self study : 15h |

**Description:**
- Introduction
- 2G, 3G, 4G and 5G
- Professional / Private Mobile Radio (PMR) systems
- Aeronautical systems
## 5. Radio Links

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

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

## 6. Satellites

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

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

## 7. Broadband Access Systems and Technologies

**Learning time:** 12h  
Theory classes: 4h  
Self study: 8h

**Description:**  
- Introduction  
- X-DSL Systems  
- Fiber to the X (FTTX) Concept  
- Cable Modem (HFC Networks)  
- Power Line Communications  
- WIMAX  
- Radio over Fibre
8. NEXT GENERATION NETWORKS: NGN

**Description:**
- Introduction NGN
- Architecture NGN
- IP multimedia subsystem: IMS
- IMS SIP
- IMS: Further Considerations and Some Examples

**Learning time:** 9h
- Theory classes: 3h
- Self study: 6h

9. Use Cases Presentation

**Description:**
- Presentation of different Telecommunication Systems use cases
- Discussion

**Learning time:** 25h
- Theory classes: 3h
- Self study: 22h

**Qualification system**

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

Complementary:


Others resources:

- Ramon Agustí, Course Slides, ETSETB, ATENEA