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

## 1. Introduction to Telecommunication Systems and Services

**Learning time:** 7h 30m  
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.)

## 2. Regulatory and Standardization Framework

**Learning time:** 7h 30m  
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.)

## 3. PSTN and INTERNET: Evolution

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

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

## 4. Mobile Communications

**Learning time:** 25h  
Theory classes: 10h  
Self study: 15h

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

**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)
Bibliography

Complementary:


Others resources:

Ramon Agusti, Course Slides, ETSETB, ATENEA