Course guide
230649 - TSYS - Telecommunications Systems

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 739 - TSC - Department of Signal Theory and Communications.
Degree: MASTER'S DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 2013). (Compulsory subject).
MASTER'S DEGREE IN ADVANCED TELECOMMUNICATION TECHNOLOGIES (Syllabus 2019). (Optional subject).
Academic year: 2023
ECTS Credits: 5.0
Languages: English

LECTURER

Coordinating lecturer: Consultar aquí / See here: https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/responsables-assignatura
Others: Consultar aquí / See here: https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/professorat-assignat-idioma

PRIOR SKILLS
Basic knowledge about communications.

REQUIREMENTS
None specific to the subject

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
- Individual work (task assignments)
- Group work
- Exam
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.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Self study</td>
<td>86,0</td>
<td>68.80</td>
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<tr>
<td>Hours large group</td>
<td>39,0</td>
<td>31.20</td>
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Total learning time: 125 h
CONTENTS

TELECOMMUNICATION SYSTEMS

Description:
Chapter 1.- Introduction to Telecommunication Systems and Services
1.1. Definitions and baseline concepts
1.2. Telecommunication systems/networks
1.3. Telecommunication services
1.4. Telecommunication market actors and business models
1.5. Telecommunication market size

Chapter 2.- Regulatory and standardization framework
2.1.- Introduction
2.2.- Telecommunication regulation
2.3.- Spectrum regulation
2.4.- Telecommunication standardization

Chapter 3.- Fixed Communications Systems
3.1.- The Public Switched Telephone Network (PSTN)
3.2.- Wide area data transmission and multi-service networks
3.3.- The Internet
3.4.- Multi-service broadband network architecture and Next Generation Access (NGA)
3.5.- Next Generation Networks (NGN)
3.6.- Wireless Wireline Convergence (WWC)

Chapter 4.- Mobile Communications Systems
4.1.- Introduction to mobile communications
4.2.- Cellular systems - basic concepts
4.3.- From 1G to 3G systems
4.4.- 4G systems: LTE
4.5.- 5G systems
4.6.- Professional Mobile Radio (PMR)

Chapter 5.- Virtualization Technologies in Telecommunications
5.1.- Virtualization concept and technologies
5.2.- Network Function Virtualization (NFV)
5.3.- NFV Management and Orchestration (MANO)

Chapter 6.- Transport Networks
6.1.- Introduction
6.2.- Topologies
6.3.- Transport protocols (PDH, SDH, Carrier Ethernet)
6.4.- Optical Transport Networks
6.5.- Microwave radio links

Chapter 7.- Satellite Communications Systems
7.1.- Fundamentals
7.2.- Spectrum and regulation
7.3.- Satellite market and industry
7.4.- Satellite applications and mainstream system architectures
7.5.- Standards for satellite communications

Chapter 8.- Presentations of selected topics in telecommunication systems

Related competencies:
CE15. 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.
CE2. Ability to develop radio-communication systems: antennas design, equipment and subsystems, channel modeling, link dimensioning and planning.
CE3. Ability to implement wired/wireless systems, in both fix and mobile communication environments.

CT4. 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.

CT5. 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.

**Full-or-part-time:** 125h  
Theory classes: 39h  
Self study: 86h

**GRADING SYSTEM**

Final exam: 40%  
Group work: 40%  
Task assignments: 20%

**BIBLIOGRAPHY**

**Complementary:**

**RESOURCES**

**Other resources:**
Course Slides, ETSETB, ATENEA