

Course guide

230649 - TSYS - Telecommunications Systems

Last modified: 11/04/2025

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: 2025	ECTS Credits: 5.0	Languages: English

LECTURER

Coordinating lecturer:	JORGE PEREZ ROMERO
Others:	Primer quadrimestre: RAMON ANTONIO FERRUS FERRE - 10 JORGE PEREZ ROMERO - 10

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

Type	Hours	Percentage
Self study	86,0	68.80
Hours large group	39,0	31.20

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.- TDM-based technologies (PDH, SDH/SONET)
- 6.4.- Packet-based technologies (Ethernet/Carrier Ethernet)
- 6.5.- Optical Transport Networks (OTN)
- 6.6.- 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:

- Telecommunication system engineering. Hoboken, NJ: Wiley, 2004.
- Valdar, A. Understanding telecommunication networks. Institution of Engineering and Technology, 2006. ISBN 978-0863413629.
- Minoli, D. Telecommunications technology handbook [on line]. 2nd ed. Artech House, 2003 [Consultation: 21/04/2020]. Available on: <https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=227657>. ISBN 9781580537087.
- Van Bosse, J.G.; Devetak, F.U. Signaling in telecommunication networks. 2nd ed. John Wiley & Sons, 2006. ISBN 978-0471662884.
- Hernando Rábanos, J.M.; Riera Salís, J.M.; Mendo Tomás, L. Transmisión por radio. 7a ed. Madrid: Centro de Estudios Ramon Areces, 2013. ISBN 9788499611068.
- Huidobro, J.M. Redes y servicios de telecomunicaciones. 4a ed. Madrid: Paraninfo, 2006. ISBN 978-8428329224.
- Stallings, W. Data and computer communications [on line]. 10 th ed. Boston: Pearson/Prentice Hall, 2014 [Consultation: 08/02/2023]. Available on: <https://ebookcentral-proquest-com.reursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pg-origsite=primo&docID=5173650>. ISBN 9780133506488.

RESOURCES

Other resources:

Course Slides, ETSETB, ATENEA