Last update: 06-05-2019

230257 - TELESP - Space Telecommunications

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering

Teaching unit: 739 - TSC - Department of Signal Theory and Communications

Academic year: 2019

Degree: BACHELOR'S DEGREE IN TELECOMMUNICATIONS SYSTEMS ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S DEGREE IN TELECOMMUNICATIONS SCIENCE AND TECHNOLOGY (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Teaching unit Optional)

ECTS credits: 6 Teaching languages: English

Teaching staff

Coordinator: Francesc Rey.

Others: Francesc Rey.

Opening hours

Timetable: This information will be privided during the first class.

Prior skills

Digital communications. RF circuits and techniques. Radio links and antennas.

Requirements

Teaching methodology

Lectures and proposed activities.

Learning objectives of the subject

To provide students with a good knowledge of the most widespread techniques used in satellite communications. Basic contents of the course are the following. Description of a space radio link and its power balance. Multiple access and packet radio techniques. VSAT systems. Satellite-based mobile communications systems.

Last update: 06-05-2019

230257 - TELESP - Space Telecommunications

Study load

Total learning time: 150h	Hours large group:	39h	26.00%
	Hours small group:	13h	8.67%
	Self study:	98h	65.33%

Last update: 06-05-2019

230257 - TELESP - Space Telecommunications

Content

1. Introduction

Degree competences to which the content contributes:

Description:
Introdution to space communications

2. A study of the environment in space.

Degree competences to which the content contributes:

Description:
2.1 Introduction
2.2 Orbital principles and orbits
2.3 Limitations of the space communications
2.4 Different orbits used in satellite communications
2.6 Satellite launch

3. Payload.

Degree competences to which the content contributes:

Description:
3.1 Introduction to the satellite subsystems
3.2 Payload description
    3.2.1 Transponder
    3.2.2 High Power Amplifier (non-linear HPA)
3.3 Antenna subsystem

4. Satellite channel.

Degree competences to which the content contributes:

Description:
4.1 Propagation in free space conditions
4.2 Atmospheric impairments
4.3 Interferences
4.4 Multipath in satellite systems (Land Mobile Satellite Channel)
4.5 Noise in satellite communications

5. Link budget

Degree competences to which the content contributes:

Last update: 06-05-2019

230257 - TELESP - Space Telecommunications

Description:
5.1 Propagation loss
5.1.1 Transmission equation. PIRE
5.1.2 Atmospheric gases attenuation
5.1.3 Rain attenuation
5.2 Noise
5.2.1 Temperature of antenna
5.2.2 Atmospheric noise
5.2.3 G/T factor
5.3 Link budget: some examples
5.4 Link budget in deep space communications

6. PHY in satellite communications.

Degree competences to which the content contributes:

Description:
6.1 Introduction to PHY Layer
6.2 Modulations (a satèl.lit communications perspective)
6.3 Channel coding (a satèl.lit communications perspective)

7. MAC in satellite communcations.

Degree competences to which the content contributes:

Description:
7.1 Introdution to MAC techniques
7.2 FDMA / TDMA / CDMA
7.3 Random access techniques
7.4 Review of MAC techniques (a satellite communications perspective)

8. Networks and digital satellite servicies.

Degree competences to which the content contributes:

230257 - TELESP - Space Telecommunications

Description:
8.1 Broadcast Satellite Services
DVB-S, DVB-S2, DVH-SH
8.2 Return link with satellite.
DVB-RCS. Example Amheris.
8.3 VSAT networks.
VSAT link.
8.4 Mobile Satellite Services (MSS)
Examples: Inmarsat, Iridium, Globastar.
8.5 IP satellite
Examples Inmarsat BGAN and ASTRAConnect.

9. Projects and emerging technologies.

Degree competences to which the content contributes:

Description:
9.1 Recent and future ESA / NASA projects
9.2 Satellite Laser Communications
9.3 High Throughput Satellites (HTS)
9.4 Deep Space Comunications

Qualification system

- Final examination : 50 %
- Continuous assessment : 40 %
- Proposed activities: 10%

Regulations for carrying out activities

Last update: 06-05-2019

230257 - TELESP - Space Telecommunications

Bibliography

Basic:

Maral, G.; Bousquet, M. Satellite communications systems: systems, techniques and technology. 5th ed. London: John Wiley and Sons, 2009. ISBN 9780470714584.

Gordon, G.D.; Morgan, W.L. Principles of communications satellites. New York: Wiley, 1993. ISBN 047155796X.

Ha, T.T. Digital satellite communications. 2nd ed. New York: Macmillan, 1990. ISBN 0070253897.

Complementary:

Pattan, B. Satellite-based global cellular communications. New York: McGraw-Hill, 1998. ISBN 0070494177.

Others resources: