# 230257 - TELESP - Space Telecommunications

<table>
<thead>
<tr>
<th>Coordinating unit:</th>
<th>230 - ETSETB - Barcelona School of Telecommunications Engineering</th>
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</thead>
<tbody>
<tr>
<td>Teaching unit:</td>
<td>739 - TSC - Department of Signal Theory and Communications</td>
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<tr>
<td>Academic year:</td>
<td>2019</td>
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<tr>
<td>Degree:</td>
<td>BACHELOR'S DEGREE IN TELECOMMUNICATIONS SYSTEMS ENGINEERING (Syllabus 2010). (Teaching unit Optional)</td>
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<td></td>
<td>BACHELOR'S DEGREE IN TELECOMMUNICATIONS SCIENCE AND TECHNOLOGY (Syllabus 2010). (Teaching unit Optional)</td>
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<td>BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Teaching unit Optional)</td>
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<tr>
<td>ECTS credits:</td>
<td>6</td>
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<tr>
<td>Teaching languages:</td>
<td>English</td>
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</tbody>
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## Teaching staff

**Coordinator:** Francesc Rey.

**Others:** Francesc Rey.

### Opening hours

**Timetable:** This information will be provided 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.
## Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 39h</th>
<th>26.00%</th>
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<tbody>
<tr>
<td></td>
<td>Hours small group: 13h</td>
<td>8.67%</td>
</tr>
<tr>
<td></td>
<td>Self study: 98h</td>
<td>65.33%</td>
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</table>
# 230257 - TELES - Space Telecommunications

## Content

### 1. Introduction

**Degree competences to which the content contributes:**

**Description:**

Introduction 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:**
6. PHY in satellite communications.

Degree competences to which the content contributes:

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

7. MAC in satellite communications.

Degree competences to which the content contributes:

Description:
7.1 Introduction 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 services.

Degree competences to which the content contributes:
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**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 ASTRACONNCT.

**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 Communications

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

**Regulations for carrying out activities**
Bibliography

**Basic:**


**Complementary:**


**Others resources:**