The course provides the basic concepts and techniques necessary to work on the development and use of spaceborne and airborne sensors for earth observation.

Prior skills

Remote Sensing is a multidisciplinary subject applied to Earth Observation and uses a large number of technologies and techniques related to Microwaves, Antennas, Optics, Radar, Signal Processing which are studied in other Courses. For this reason it is recommended having notions of these topics. The eventual lack of knowledge of the cited areas can be easily surmountable by consulting basic reference books.

Teaching methodology

Fundamentals Lectures
Exercises
Laboratory practice
Selected Topic teamwork

Learning objectives of the subject

The course provides the basic concepts and techniques necessary to work on the development and use of spaceborne and airborne sensors for earth observation.

Study load

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

<table>
<thead>
<tr>
<th>Section</th>
<th>Learning time: 1h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Introduction</strong></td>
<td>Theory classes: 1h</td>
</tr>
</tbody>
</table>

**Description:**
The course contents and objectives are presented
1.1 Remote Sensing techniques and technologies

<table>
<thead>
<tr>
<th>Section</th>
<th>Learning time: 4h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2. Air and space platforms. Space missions</strong></td>
<td>Theory classes: 4h</td>
</tr>
</tbody>
</table>

**Description:**
2.1 Mission Phases and Segments
2.2 Types of orbits. Orbital parameters and perturbations
2.3 Polar orbits. Synchronism with the Earth and the Sun.

<table>
<thead>
<tr>
<th>Section</th>
<th>Learning time: 4h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3. Mapping projections. GIS systems</strong></td>
<td>Theory classes: 4h</td>
</tr>
</tbody>
</table>

**Description:**
3.1 Mathematical model of the earth surface. The Geoid
3.2 Global and local ellipsoids. Datum and coordinate transformations
3.3 Mapping projections. UTM and Mercator
3.4 Integration of remote sensing images in GIS systems

<table>
<thead>
<tr>
<th>Section</th>
<th>Learning time: 12h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4. RADAR sensors</strong></td>
<td>Theory classes: 12h</td>
</tr>
</tbody>
</table>

**Description:**
4.1 Radar backscattering
4.2 Radar polarimetry. Calibration
4.3 Real and and Synthetic Aperture Radars (SAR)
4.4 SAR image reconstruction
4.5 Geometric correction and noise reduction (speckle) in SAR images
4.6 Other radar sensors: scatterometers and altimeters
### 5. Optical and infrared sensors

**Description:**
- 5.1 The impact of atmosphere
- 5.2 Spectral signatures of materials
- 5.3 Sensor Technology
- 5.4 Cameras and hyperspectral classification
- 5.5 Geometric correction of optical images
- 5.6 Examples of space programs: NOAA, Meteosat, Landsat, etc.
- 5.7 Laser sensors (LIDAR) and applications

**Learning time:** 12h  
**Theory classes:** 12h

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### 6. Microwave radiometers

**Description:**
- 6.1 Radiation Laws
- 6.2 Brightness, Apparent and Antenna Temperatures
- 6.3 Total power and Dicke radiometers
- 6.4 Calibration and Applications

**Learning time:** 12h  
**Theory classes:** 12h

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### 7. Image characteristics and post-processing

**Description:**
- 7.1 Quality parameters and evaluation
- 7.2 Radiometric and geometric distortions

**Learning time:** 4h  
**Theory classes:** 4h

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### 8. The Remote Sensing sector

**Description:**
- 8.1 Main agencies and institutions
- 8.2 Final users categories. Business and Careers

**Learning time:** 4h  
**Theory classes:** 4h
230252 - TELED - Remote Sensing and Earth Observation Systems

Qualification system

- Final examination 60%
- Written group assignment 20%
- Practical laboratory work (1h per week on average): 20%

Regulations for carrying out activities

A4 form written both sides can be brought to the exam with formulas, duration 2 h.

Bibliography

Basic:


Complementary:


Others resources:

http://www.grss-ieee.org/cool-videos/

Hyperlink

Remote Sensing Tutorial In Spanish, French, Portuguese, and English
Recurrs

Remote Sensing Video Tutorials in Spanish & English
Remote Sensing Video Tutorials in Spanish & English

Audiovisual material

Remote Sensing Cool Videos (for K-12)
Remote Sensing Introductory Videos for K-12