Advanced Remote Sensing

Code: 43382
ECTS Credits: 9

2024/2025

Degree	Type	Year
4314828 Remote Sensing and Geographical Information Systems	OT	0

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Teachers

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

Prerequisites are not required

Objectives and Contextualisation

This optional module, expands the knowledge acquired in the module of obtaining geographic information of this same master's degree from the study of techniques and applications specific to remote sensing in fields such as meteorology, oceanography, geology and the study of vegetation.

At the end of the course, the student will be able to:

- Apply the methodologies to alleviate the different sources of error in order to visualize and extract physical parameters of the received data.

- Apply remote sensing techniques to different fields of research and applied.

Competences

- Apply different methodologies for the primary processing of images obtained by remote sensors in order to subsequently extract geographic information.
- Continue the learning process, to a large extent autonomously.
- Identify and propose innovative, competitive applications based on the knowledge acquired.
- Take a holistic approach to problems, offering innovative solutions and taking appropriate decisions based on knowledge and judgement.
- Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
- Use the different techniques for obtaining information from remote images.
- Write up and publicly present work done individually or in a team in a scientific, professional context.

Learning Outcomes

1. Apply remote sensing techniques to different research and applied-research fields.
2. Continue the learning process, to a large extent autonomously.
3. Correctly apply methodologies to mitigate the different sources of error in order to visualise and extract physical parameters from the data received.
4. Identify and propose innovative, competitive applications based on the knowledge acquired.
5. Take a holistic approach to problems, offering innovative solutions and taking appropriate decisions based on knowledge and judgement.
6. Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
7. Write up and publicly present work done individually or in a team in a scientific, professional context.

Content

RS & METEOROLOGY. TECHNIQUES & EXAMPLES

1. Introduction
2. Classical meteorology
3. Interpretation of satellite images
3.1 Images in the visible spectrum
3.2 Images in the thermal infrared
3.3 Images of water vapor
3.4 Compositions RGB
4. The weather radar
4.1 Propagation of the microwave into the atmosphere
4.2 The radar equation
4.3 Observations of the Doppler radar

RS & OCEANOGRAPHY. TECHNIQUES & EXAMPLES

1. Introduction
2. Fundamentals of Oceanography
2.1 Descriptive oceanography
2.2 Dynamic oceanography
2.3 Remotely observable phenomena
3. Observation with passive sensors
3.1 Observation in the visible spectrum
3.2 Observation in the infrared spectrum
3.3 Observation in the microwave spectrum

4. Observation with active sensors
4.1 Generalities
4.2 The dispersometer
4.3 The SAR
4.4 The altimeter
5. Application: sea currents

RS & GEOLOGY. TECHNIQUES & EXAMPLES

Contents based on a series of guided practical exercises dedicated to showing examples of the use of Remote Sensing in the monitoring of volcanoes, episodes of floods, monitoring of the evolution of snow and ice, etc.

RS & VEGETATION. TECHNIQUES & EXAMPLES

1. The problematic thematic/spectral classes. Land uses and land coverings.
2. Specific techniques.
2.1 Spectral separability
2.2 Vegetation indexes
2.3 Tasseled Cap Transformation.
3. Prevention of forestfires.
4. Active fire.
5. Techniques of analysis of changes in time.
5.1 Assessment of burnt surfaces.
5.2 Studies of regeneration of vegetation after forest fires.
6. Analysis and multitemporal classification of roofs (example of crops)
6.1 Spectral signatures
6.2 Phenology and temporary signatures
6.3 Classification
6.4 Analysis of changes
6.5 Enrichment of databases
7. Examples of practical applications

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Master classes / exhibitions	48	1.92	1, 2, 3, 4, 5, 6, 7
Type: Supervised			
Classroom practices	60	2.4	1, 2, 3, 4, 5, 6, 7
Tutorials	4	0.16	1, 2, 3, 4, 5, 6, 7
Type: Autonomous			
Personal study	22	0.88	1, 2, 3, 4, 5, 6, 7
Personal study	90	3.6	1, 2, 3, 4, 5, 6, 7

Principal working language: spanish (spa), although the bibliographic materials may be in other languages, mostly English.

In this module there are 3 groups of learning activities:

- Targeted activities consist of classes of theory and practices that will be carried out in a specialized computer room. At the beginning of each of the subjects that make up the module, the teachers will explain the structure of the theoretical-practical contents, as well as the evaluation method.
- Supervised activities consist of classroom practices that will allow you to prepare the work and exercises of each subject, as well as tutorial sessions with the teachers in case the students request it.
- Autonomous activities are a set of activities related to the elaboration of works, exercises and exams, such as the study of different material in the form of journal articles, reports, data, etc., defined according to the needs of autonomous work of each student.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Practical works	80%- 90%	0	0	1, 2, 3, 4, 5, 6, 7
Theoretical exam	10%-20%	1	0.04	1, 2, 3, 4, 5, 6, 7

This module does not incorporate single assessment.

The evaluation of this module consists of the following system:

- The realization of 2 exams, that will be between 10 % and 20 % of the final mark and that will include the theoretical and practical contents carried out. An exam not reaching the minimum mark of 5 out of 10 must be repeated the day assigned by the teacher of the subject.
- The accomplishment of different practical works proposed throughout the teaching of the module and delivered within the fixed term, that will be between 80 % and 90 % of the final mark. A correct formal presentation and careful preparation will be taken to account.

Aspects to take into account.

- Regular class attendance is highly recommended in order to follow the lessons properly. Follow on through streaming is only justified in cases of physical impossibility for face-to-face assistance, since an important part of the experiences and learning are fully achieved through contact with the teaching staff and classmates.
- If you have to deliver practical work, this delivery must be done within the deadlines for them to be evaluated.
- On carrying out each evaluation activity, Lecturers will inform of the procedures to be followed for reviewing all grades awarded, and the date on which such a review will take place.

Extraordinary exams.

- The exams or other evaluation procedures not reaching the minimum mark of 5 out of 10 must be repeated. This extraordinary exam is unique.
- Students will have the opportunity to take a extraordinary exam the day or days scheduled by the faculty.

Cheating: Copies and plagiarisms.

- By copies, we refer to the evidence that thework, project, exam, etc has been partially or totally created/answered without the intellectual contribution of the author. In this definition, we also include theproven attempt to copy in the exams and delivered works and projects and the violation of the laws that assure intellectual authorship. Plagiarisms refer to the works and texts from other authors that someone pretends to be his/her own creation. It is a crime against intellectual property. In order to avoid committing plagiarism, quote all the sources that you use when writing the report of a project. According to UAB's law, copies and plagiarisms or any other attempt to alter the results of one's own evaluation or someone else's -allowing to copy, for example- implies a result in the corresponding part (theory, problems or practical tasks) of a 0 and, in this case, the student will fail the subject. This does not limit the right to take academic and legal actions against those who have participated. See UAB documentation about copies and plagiarisms
  http://wuster.uab.es/web_argumenta_obert/unit_20/sot_2_01.html

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Software

MiraMon, ArcGIS, QGIS, BILKO, SNAP, Office Microsoft

Language list

Name	Group	Language	Semester	Turn
(TE) Theory	1	Catalan/Spanish	second semester	morning-mixed