UAB
Universitat Autònoma de Barcelona

# Teledetection

2026/2027

Code: 104272
Credits: 6

| Degree programme | Type | Course |
|---|---|---|
| Geography, Environmental Management and Regional Planning | OP | 3 |

## Contact lecturer

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## Teaching staff

Mario Padial Iglesias

## Group languages

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

## Prerequisites

Having completed a first course in Geographic Information Systems is advisable, but not essential, as well as having basic knowledge of Cartography.

To take this course, students must have a command of Catalan and/or Spanish at level B2 or higher.

Most bibliography of the subject is in English, so the student should be able to at least read in that language.

## Objectives

This is an elective subject that can be taken in either the 3rd or 4th year.

In recent years, remote sensing has became a basic tool in geographic analysis thanks to the systematic availability of satellite images and, increasingly, aerial images, whether from aircraft or, lately , from UAV devices like drones. The discipline has experienced a spectacular evolution since the first images available for civil use in the early 1970s to the present day. Nowadays there are many orbiting sensors around the earth's surface that allow us to analyze it in a way never seen. In this sense, the subject represents an interesting opportunity to understand the scope of Remote Perception as a discipline and its contribution to the urban systems knowledge.

In the course, it is not intended to train in a specific software. The message is that in the case of a case of use, the student must know (or learn if necessary) the necessary concepts, understand what strategies it is appropriate to apply and know what tools are available. With this in mind, the maturity of the case of use will allow you to find out what features you need in each situation and choose or adapt to the possibilities that you will find at each moment and place of the future development of your activity.

Among the objectives presented in the course, which are both theoretical and practical, we should highlight:

- Know the main platforms and sensors available in Remote Sensing. This objective will be achieved through theoretical discourse, study and a search exercise to be carried out by the students.
- Understand the nature of multispectral images and the characteristic response of the main types found in the soil. The theoretical discourse will be dressed with a series of examples from the most conceptual point of view (spectral band, spectral signatures, electromagnetic spectrum), as practical (evaluation and interpretation of spectral signatures of different covers, false color composites, etc). The practical part of the subject, then, will begin with the definition of the legendand the demonstration of the spectral separability of different ground coverings.
- Know how to perform the basic treatment of the images, from their acquisition to their exploitation for categorical thematic cartography. This objective will be achieved in several cases applied until the determination of the thematic accuracy of the obtained cartography and through careful editing of the final maps.
- Learn about Remote Sensing applications in different areas: forestry, agriculture, urban environment, forest fire dynamics, vegetation monitoring, water resources, ...

## Learning outcomes

- CM27 (Use geographical information systems as a tool to obtain answers to certain questions related to geoinformation.) Use geographical information systems as a tool to obtain answers to certain questions related to geoinformation.
- CM28 (Make use of GIS in the understanding of spatial, environmental, economic and social phenomena.) Make use of GIS in the understanding of spatial, environmental, economic and social phenomena.
- KM41 (Identify the main platforms and sensors available in remote sensing.) Identify the main platforms and sensors available in remote sensing.
- SM38 (Carry out the basic processing of images, from their acquisition to their exploitation for thematic cartography of a categorical type.) Carry out the basic processing of images, from their acquisition to their exploitation for thematic cartography of a categorical type.

## Contents

The various aspects to be developed in the subject are:

1. Overview of Remote Sensing.
2. The electromagnetic spectrum and the spectral signatures.
3. Remote sensing basic concepts: spatial, radiometric, spectral and temporal resolution.
4. Types of platforms and sensors. Main satellites and sensors.
5. Nature of the images. Formats. Elemental notions of geometric and radiometric corrections.
6. Imatge transforations. Vegetation indices.
7. Techniques of digital classification. Verification of results. Final cartographic refinement. Post-classification techniques.
8. Remote Sensing aplications in several domains.

The application in practical cases will be developed throughout the course, in an integrated way in the various subjects covered in the course.

## Learning activities and methodology

| Title | Hours | ECTS | Learning outcomes |
|---|---|---|---|
| Presentation of basic concepts | 29.5 | 1.18 | |
| Preparation and presentation of results | 15 | 0.6 | |
| Approach to the objective and method of solving the practices | 12 | 0.48 | |
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|---|---|---|---|
| Study of theoretical material | 30 | 1.2 | |
| Class practices done independently by the students | 30 | 1.2 | |
| Guided resolution of the practices in the computer lab | 25 | 1 | |
| Field trip | 4 | 0.16 | CM27, CM28 |

The contents of the subject will be developed through the following activities:

- Oral presentations and documentation and reading guides presented by the teacher or Reading of chapters of books or articles (individual activity of the students complementary to the classroom work).
- Teacher-guided class practices and practice development guides provided by the teacher.
- Practices carried out autonomously by the students based on proposals from the teachers.
- Field trip for the visual interpretation of the main land use land cover types, in the Banyoles and Mieres area. It will be conducted in accordance with the official Field Trip Protocol established by the Faculty. Students will be provided with specific safety documentation related to off-campus activities organized by the Universitat Autònoma de Barcelona (UAB). It is the responsibility of each student to review and acknowledge this documentation prior to participating in any field activity.

For the accomplishment of the subject, specific desktop software will be used (MiraMon) and in web environment (different web browsers and tools such as Google Earth Engine).

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

## Continuous assessment activities

| Title | Weight | Hours | ECTS | Learning outcomes |
|---|---|---|---|---|
| Preparation and presentation of personal projects, or Article comments | 10 % | 0 | 0 | KM41 |
| Practical exercises | 30 % | 0 | 0 | CM27, CM28, KM41 |
| Practical exams | 20% | 1.5 | 0.06 | SM38 |
| Theoretical exams | 40% | 3 | 0.12 | KM41 |

The evaluation activities are:

- Small theoretical exams (40% of the grade) and small practical exams (20% of the grade), taken throughout the course, in the form of a truly continuous assessment. These exams will be in person, short (approximately 30 ') and will be carried out at the beginning of the class, approximately biweekly to check that there is a progress in the study and understanding of the topics of the course. Then is is consolidated as needed in the classroom with the teacher also through practical exercises. In addition, the results of the micro-assessments are obtained almost immediately, which allows the student to have a very fine control of how the course is advancing. This brings us closer to a flipped classroom teaching strategy, in which students do not have to prepare for partial or final exams because they prepare classes in advance, self-assessing themselves continuously and consolidating in the classroom, resolving doubts and tackling all kinds of practical exercises (but based on a good knowledge of theory).
- Practical exercises delivered throughout the subject (30% of the grade), Comments on articles or Preparation and presentation of works (10%).

The subject is passed with a 5. The student who has presented less than 30% of the requested works as one that has not been submitted to any of the theoretical-practical tests will be considered \"not evaluable\".

The re-evaluation will be of all the theoretical and practical syllabus, within the dates stipulated for that purpose by the Faculty.

This subject does not provide for a single assessment system.

The copying or plagiarism of material, both in the case of works and in the case of examinations, constitute a crime that will be sanctioned with a zero to the activity. In the case of recidivism, the entire subject will be suspended. Let's remember that a \"copy\" is considered a work that reproduces all or most of the work of one or more partners. \"Plagiarism\" is the fact of presenting all or part of an author's text as itsown, without citing the sources, whether in paper or in digital format. See UAB documentation on \"plagiarism\" at: http://wuster.uab.es/web_argumenta_obert/unit_20/sot_2_01.html.

In the event of a student committing any irregularity that may lead to a significant variation in the grade awarded to an assessment activity, the student will be given a zero for this activity, regardless of any disciplinary process that may take place. In the event of several irregularities in assessment activities of the same subject, the student will be given a zero as the final grade for this subject.

In theevent that tests or exams cannot be taken onsite, they will be adapted to an online format made available through the UAB's virtual tools (original weighting will be maintained). Homework, activities and class participation will be carried out through forums, wikis and/or discussion on Teams, etc. Lecturers will ensure that students are able to access these virtual tools, or will offer them feasible alternatives.

On carrying out each evaluation activity, lecturers will inform students (on Moodle) of theprocedures to be followed for reviewing all grades awarded, and the date on which such a review will take place.

Use of Artificial Intelligence: For this subject, the use of Artificial Intelligence (AI) technologies is permitted in support tasks, such as bibliographic or information searches, text correction or translations. It is alsoe allowed as remote sensing images classifaction tool.The student must clearly identify which parts have been generated with this technology, specify the tools used and include a critical reflection on how these have influenced the process and the final result of the activity. The lack of transparency in the use of AI in this assessable activity will be considered a lack of academic honesty and may lead to a partial or total penalty in the grade of the activity, or greater sanctions in serious cases. The use of IA in examns is conisdered a serious plagiarism.

## Bibliography

Reference books and cartography


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- Barret, E. C. i L. F. Curtis (1999). *"Introduction to Environmental Remote Sensing".* Cheltenham, Stanley Thornes Publishers Ltd.
- Campbell, J. B. i Wynne, R. (2011). *"Introduction to Remote Sensing",* New York, The Guilford Press. 667 pàgs. 5ª edició.
- Chuvieco, E. (2010). *"Teledetección Ambiental",* Barcelona, Ariel. 592 pàgs. 3ª edició.
- Colwell, R.N. (1983). *"Manual of Remote Sensing".* American Society of Photogrammetry. Falls Church. Virginia. 2 vol.
- Conway, E. D. (1997). *"An introduction to satellite image interpretation",* Baltimore, John Hopkins University Press.
- Cracknell, A. P. i L. W. B. Hayes (2007). *"Introduction to Remote Sensing",* London, CRC Press, Boca Ratón. 335 pàgs. 2ª edició (1ª edició de 1991).
- Díaz-Delgado, R., Lucas, R. and Hurford, C. (Eds.) (2017). \"*The Roles of Remote Sensing in Nature Conservation. A Practical Guide and Case Studies*\". Springer International Publishing AG2017. Pp. 318. Springer, Cham, Switzerland.
- Emery, W. i A. Camps (2017). \"*Introduction to Satellite Remote Sensing. Atmosphere, Ocean, Land and Cryosphere Applications*\". Elsevier. 860 pàgs.

- Fra, U. (2011). \"*Diccionari terminològic de fotogrametria*\". Barcelona: Institut Cartogràfic de Catalunya: Enciclopèdia Catalana. 351 p
- Girard, M.C. i C.M. Girard (1999). *"Traitement des données de télédétection".* Dunod. Paris. 529 pàgs. ISBN 2-10-004185-1.
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- Institut Cartogràfic de Catalunya (1992) \"*Mapa d'usos del sòl de Catalunya*\". Institut Cartogràfic de Catalunya. Barcelona. 118 pàgs. + 20 làmines + 1 mapa.
- Jensen, J.R. (2016). \"*Introductory Digital Image Processing. A Remote Sensing Perspective*\". Prentice Hall. Englewood Cliffs. 656 pàgs. 4ª edició.
- Lillesand, T.M., R.W. Kiefer i J. Chipman (2015). \"*Remote Sensing and Image Interpretation*\". John Wiley & Sons. N.Y. 736 pàgs. 7ª edició.
- Mather, P.M. i M. Koch (2010). \"*Computer Processing of Remotely-Sensed Images*\". J. Wiley & Sons. Chichester. 460 pàgs. 4ª edició.
- Nunes, J. (2012). *"Diccionari terminològic de sistemes d'informació geogràfica".* Enciclopèdia Catalana i Institut Cartogràfic de Catalunya, Barcelona. 551 p.
- Paine, D. i J. Kiser. (2003). \"*Aerial Photography and Image Interpretation*\". J. Wiley & Sons. Chichester. 648 pàgs. 2ª edició.
- Pinilla, C. (1995). *"Elementos de Teledetección Espacial".* Madrid, RA-MA.
- Pons, X., Arcalís A. (2012). *"Diccionari terminològic de Teledetecció".* EnciclopèdiaCatalana i Institut Cartogràfic de Catalunya, Barcelona. 597p. Disponible online: http://www.termcat.cat/ca/Diccionaris_En_Linia/197
- Rabella, J.M., Panareda, J.M., Ramazzini, G. (2011). *"Diccionari terminològic de cartografia".* Enciclopèdia Catalana i Institut Cartogràfic de Catalunya, Barcelona. 417 pàgs.
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- Richards, J. A. i X. Xia (2005). *"Remote Sensing Digital Image Analysis. An Introduction".* Berlin, Springer-Verlag. 439 pàgs. 4ª edició.
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- Ustin, S. (Ed.) (2008). *"Remote Sensing for Natural Resource Management and Environmental Monitoring".* (Manual of Remote Sensing - Third Edition), Wiley and American Soc. of Photogrammetry and Remote Sensing. New York. 768 p.


Reference journals

- *Remote Sensing of Environment*. Elsevier Science Publishing Co. Inc.
- *IEEE Transactions on Geoscience and Remote Sensing*. Institute of Electrical and Electronics Engineers. També editen *IEEE Geoscience and Remote Sensing Letters*, amb articles més curts i una més ràpida dinàmica de publicació.
- *Photogrammetric Engineering & Remote Sensing*.American Society for Photogrammetry and Remote Sensing.
- *International Journal of Remote Sensing*. Taylor & Francis Ltd.
- *Canadian Journal of Remote Sensing*. Canadian Aeronautics and Space Institute
- *ISPRS Journal of Photogrammetry and Remote Sensing*. International Society forPhotogrammetry and Remote Sensing.
- *International Journal of Applied Earth Observation and Geoinformation*. Elsevier Science Publishing Co. Inc.
- *Remote Sensing*. MDPI
- *Revista de Teledetección* de la Asociación Española de Teledetección.
- *GeoFocus* de la Asociación de Geógrafos Españoles

## Software

MiraMon. Geographic Information System and Remote Sensing software. 1994-2024.

The version to be used is the desktop one for Windows (64 and 32 bits), freely downloadable from https://www.miramon.cat/Index_usa.htm and also available in the classroom.

Web based application to Google Earth Engine platform. Free with Google account

### Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this link. To access the information, you will need to enter the course CODE

| Type of teaching | Group | Language | Semester | Shift |
|---|---|---|---|---|
| (TE) Theory | 1 | Catalan | first semester | morning-mixed |
| (PLAB) Practical laboratories | 1 | Catalan | first semester | morning-mixed |