



Universitat de Lleida

## DEGREE CURRICULUM

# GIS / TELEDETECTION

Coordination: VERICAT QUEROL, DAMIAN

Academic year 2023-24

## Subject's general information

Subject name	GIS / TELEDETECTION			
Code	101153			
Semester	2nd Q(SEMESTER) CONTINUED EVALUATION			
Typology	Degree	Course	Character	Modality
	Bachelor's Degree in Geography	2	COMPULSORY	Attendance-based
	Double degree: Bachelor's degree in Geography and Bachelor's degree i Tourism	4	COMPULSORY	Attendance-based
Course number of credits (ECTS)	6			
Type of activity, credits, and groups	Activity type	PRALAB	TEORIA	
	Number of credits	3	3	
	Number of groups	1	1	
Coordination	VERICAT QUEROL, DAMIAN			
Department	ENVIRONMENT AND SOIL SCIENCES AND CHEMISTRY			
Teaching load distribution between lectures and independent student work	<p>1. Lectures and exercises (60 hours, classroom or virtual lectures according to the limitations imposed by the COVID-19 pandemic). Here we include lectures (theory), exercises the students will develop with the supervision of the lectures, follow-up lectures and, if possible, invited conferences.</p> <p>2. Additional work: 90 hours. In these hours the student will have to go beyond the contents that are given in the lectures by reading the basic materials given in class and other complementary readings. In addition, it is during this work when the students will complete the practical exercises that will be developed, mostly, in the classroom with the teachers.</p> <p>Note: the subject may be developed in person or virtually depending on the limitations or restrictions that may be imposed by the competent bodies (University of Lleida, Generalitat de Catalunya, Spanish Government) during the semester. All the contents and methodological axes have already been adapted accordingly to guarantee the competences of the subject, whatever the way in which the subject is taught.</p>			
Important information on data processing	Consult <a href="#">this link</a> for more information.			
Language	Mainly in Catalan, although some papers and part of the presentations can be provided in English.			

## Distribution of credits

1. Introduction (0.8 credits)
  - a. Geographical Information Systems and Remote Sensing
  - b. Vector and raster data models:
  - c. Basic operations
2. Surface Modelling (1,5 credits)
  - a. Digital Surface Models
  - b. Creation of a Digital Elevation Models
  - c. Analysis of Digital Elevation Models: queries and variables
  - d. Monitoring topographic changes through sequences of Digital Elevation Models
3. Channel network and watershed delineation (1 credits)
  - a. Flow direction
  - b. Flow accumulation
  - c. Stream network delineation
  - d. Watershed delineation
  - e. Morphometric analysis of watersheds
4. Image georeferencing (0.8 credits)
  - a. Georeferencing and orthorectification
  - b. Control Points and Transformation Models: general aspects
  - c. Estimation of Errors
5. Multispectral information (1.9 credits)
  - a. Introduction: basic principles
  - b. Acquisition of satellite imagery
  - c. Spectral signatures
  - d. Spectral indices
  - e. Obtaining environmental variables

Note 1: in this distribution we have included both all theoretical and practical credits.

Note 2: There may be occasional changes depending on the progress of the group and other aspects not contemplated in the preparation of this document.

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
TENA PAGAN, ALVARO JOAQUIN	alvaro.tena@udl.cat	5	Agree date and time by mail: face-to-face or virtual.
VERICAT QUEROL, DAMIAN	damia.vericat@udl.cat	1	Agree date and time by mail: face-to-face or virtual.

## Subject's extra information

In order to be able to successfully complete this subject, it is necessary for the student to have previous knowledge on GIS. For this reason it will be necessary for the students of the Geography Degree in the University of Lleida to have passed the other subjects on cartography and GIS previously. In the case of students of other degrees, we highly recommend they contact the staff to evaluate the suitability of this subject for them.

## Learning objectives

These are the **specific objectives** of this subject:

1. Application of different GIS and remote-sensing specific software tools
2. Application of basic tools for the analysis of Digital Surface Models and multispectral information
3. Data mining: evaluating different sites to download geographic information
4. Generation of new basic cartographic information for the study and analysis of the territory
5. Designing exercises: to determine the necessary basic information, analysis tools, and the different steps to follow for the achievement of each exercise
6. Resolution of exercises: obtaining and analysing results

Specifically, the **learning outcomes** include:

- a. Practice of georeferencing at various levels: in the field and to suffer from a cartographic document
- b. Reading, comprehension and use of information from topographic maps
- c. Ability to select the most suitable form of expression from a wide range of graphic resources
- d. Diversify expressive resources
- e. Use of thematic mapping programs, both commercial and online
- f. Full familiarity with the logic of GIS
- g. Mastery of the basic tools of a GIS
- h. Agility in the relationship of databases and cartography
- i. Use of a remote sensing image processing program
- j. Full ability to design a map suitable for any case of geographical, physical or human information

## Competences

- (CB2) Apply their knowledge to their work or vocation in a professional manner and possess the skills that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.

- (CB5) Know how to develop those learning skills necessary to undertake further studies with a high degree of autonomy.

- (CG3) Characterize the spatial diversity of the territories.
- (CE1) Manage and use the methods and techniques of analysis and interpretation of statistical sources.
- (CE3) Express geographical knowledge through thematic cartography.
- (CE4) Handle the information of the topographic cartography.
- (CE5) Learn to extract sources of geographic information from existing resources on the internet.
- (CE13) Acquire the habits of analysis of the geographic data to proceed to its orderly and reasoned exposition, either through an oral presentation or through a written report.
- (CE14) Learn how to use GIS software in its different functions: data entry, editing and management, queries and spatial analysis.
- (CT3) Acquire training in the use of new technologies and information and communication technologies.

## Subject contents

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## Methodology

1. Lectures. Exhibition of basic contents (in-person master classes or by means of videoconferencing)
2. Demonstrations of tools by the teacher (in-person or by means of videoconferencing)
3. Practices in class with the presence of the responsible teacher (in-person or by means of videoconferencing)
4. Specific work outside the classroom by the student
5. Solving doubts through videoconferencing
6. Exercise resolution demonstration videos
7. Creation of forums (Virtual Campus) for the discussion of problems that arise when doing the practical exercises
8. Recorded classes and tutorials (video) to be able to review contents
9. Tutorials (if necessary, at the request of the students)

In addition, if applicable, (a) expert conferences will also be held, and (b) the students will participate in various solidarity mapathons with the aim of learning to use technologies for obtaining, generating and disseminating geographical information. These two activities will vary from year to year depending on the possibilities that arise.

## Development plan

- This is a very 'practical' subject (based on the exercises the students will carry out), although there will be introductory lectures to provide the student with basic concepts for developing the exercises. Teachers will demonstrate the tools using practical examples. In addition, there will be demonstration videos to ensure the learning of the tools. This is a subject that is closely related to other subjects of the Geography Degree. The student will autonomously learn the different GIS tools with the help of the teacher. In addition, we will try to organise conferences so that the student can see the application of the tools they are learning.
- This subject may be developed in person or virtually depending on the limitations or restrictions that may be imposed by the competent bodies (University of Lleida, Generalitat de Catalunya, Spanish Government) during the semester. All the contents and methodological axes have already been adapted accordingly to guarantee the competences of the subject, whatever the way in which the subject is taught.
- Information on data protection in the audiovisual register. In accordance with current regulations on the protection of personal data, we inform you that:
  - The organisation responsible for the recording and use of the image and voice is the University of Lleida - UdL (contact details of the representative: General Secretariat. Plaza Víctor Siurana, 1, 25003 Lleida; sg@udl.cat; contact details of the data protection officer: dpd@udl.cat).
  - The recorded images and voices shall be used exclusively for teaching purposes.
  - The recorded images and voices shall be saved and preserved until the end of the current academic year, and shall be destroyed in accordance with the terms and conditions specified in the regulations on the preservation and disposal of administrative documents of the UdL, and the documentary evaluation tables approved by the Generalitat de Catalunya (<http://www.udl.cat/ca/serveis/arxiu/>).
  - The voices and images are considered necessary to teach this subject, and teaching is a right and a duty of the teaching staff of the Universities, which they must exercise under academic freedom, as provided for

in article 33.2 of the Organic Law of Universities (Ley Orgánica de Universidades) 6/2001, of December 21. For this reason, the UdL does not need the consent of the students to register their voices and images with the sole and exclusive purpose of teaching in this particular subject.

- The UdL shall not transfer the data to third parties, except in the cases strictly provided for by the Law.
- The student can access their data; request correction, deletion or portability; object to its processing and request its limitation, as long as it is compatible with the purposes of teaching, by writing to [dpd@udl.cat](mailto:dpd@udl.cat). You can also submit a complaint to the Catalan Data Protection Authority, via a mail to its website (<https://seu.apd.cat>) or other non-electronic means.

## Evaluation

### Continuous evaluation:

#### Theoretical Block 1: data in raster format (essential/compulsory)

- Exam (Theory/Concepts). There will be an exam that accounts for 25% of the final grade of the subject. It is necessary to pass the exam in order to be able to take into account the grade of the internship. In the case of not passing the theoretical exam, the student will have the right to retake it (second exam).

#### Theoretical Block 2: georeferencing and multispectral information (essential/compulsory)

- Exam (Theory/Concepts). There will be an exam that accounts for 25% of the final grade of the subject. It is necessary to pass the exam in order to be able to take into account the grade of the internship. In the case of not passing the theory exam, the student will have the right to retake it (second exam).

#### Practice Block (essential/compulsory)

- Practical Exercises: Continuous evaluation of the exercises carried out during the practical classes (50% of the final mark). In total, practical exercises will be carried out following the contents and distribution of credits of the subject. Continuous and mandatory delivery according to the set delivery dates, or joint delivery on the day of the subject's final exam (as indicated in the faculty's calendar). If the delivery is made on the day of the exam, the maximum grade that can be chosen will be 5. This block is recoverable and to choose to take the average of the subject the minimum grade must be a 5. In the event that the practices do not obtain a minimum grade of 5, they must be submitted within the second-chance period. Failure to attend practice classes could have a penalty on the corresponding practice grade.

### Second-chance

- In the event that the exams or practices do not obtain a minimum grade of 5, they must be retaken within the period set by the faculty. In the case of recovery, the maximum grade for the internship cannot be higher than 5.

### Other considerations

- The final grade is the weighted average of the three blocks according to the weighting factors indicated above.
- All theoretical and practical teaching materials taught and given in the classroom are assessable.

### Plagiarism or copying (exams and practices)

- Law 2/2022 on university coexistence regulates what is considered academic fraud: any premeditated behavior tending to falsify the results of an exam, one's own or someone else's, taken as a requirement to

pass a subject or certify academic performance. Offenses can be serious or very serious. You can consult the [UdL's Regulations on university coexistence](#).

- When copy is detected:

If copying or plagiarism is done with fraudulent means, the assessment activity will be withdrawn (therefore it will be suspended) and a report and the evidence will be sent to the coordination of the degree and to the heads of studies to start a disciplinary file. The applicable sanctions include, among others and depending on the seriousness of the fault, the loss of the right to be evaluated for the subject, the loss of enrollment for a semester or a course or expulsion for up to three years .

If there is spontaneous copying between students (behaviours such as speaking in an exam, looking at a colleague's exam, etc.) measures will be applied that may lead to the withdrawal of the activity (therefore, it is suspended). A report will also be made to the coordination of the degree and to the heads of studies if it is considered appropriate to open a disciplinary file.

## Alternative assessment/evaluation

Students who combine their studies with a full-time job and/or due to family reconciliation have the right to request an alternative assessment at the beginning of the semester. The student who wants to take part in the alternative assessment must present a work contract or justify, in writing addressed to the dean, the reasons that make it impossible for him or her to take the continuous assessment within a period of five ( 5) days since the beginning of the semester. For more information, send an email to [academic@lletres.udl.cat](mailto:academic@lletres.udl.cat) or contact the Secretariat of the Faculty of Letters. The alternative assessment test will consist of a written test (Theory/Concepts) which will account for 50% of the final grade of the subject and the delivery of the practicals (50% of the grade). The two tests (examination and practice) are recoverable.

## Bibliography

Note: these are general references. The Student will receive further lectures and materials during the course (if appropriate).

Chuvieco E. (2016): Fundamentals of Satellite Remote Sensing: An Environmental Approach. Second Edition. CRC Press Taylor & Francis, Boca Raton, Florida, 468 pp.

Felicísimo, A., (1994): Modelos digitales de terreno. Introducción y aplicaciones en las ciencias ambientales. Pentalfa Ediciones, Oviedo, 220 pp. Available at <http://www6.uniovi.es/~feli/pdf/libromdt.pdf>

Martínez-Casanovas, JA. (1999) : Quaderns d'informació num. 25. Modelos digitales de terreno: estructuras de datos y aplicaciones en análisis de formas del terreno y en edafología. Departament de Medi Ambient i Ciències del Sòl. Universitat de Lleida. 55p. Available at

<http://web.udl.es/dept/mac/sedai/referenc/Quaderns/MDT.pdf>

Moore, I.D., Grayson, R.B. Y Landson, A.R., 1991. Digital terrain modelling: A review of hydrological, geomorphological, and biological applications. Hydrological Processes, 5: 3- 30.

Rosell, J.I., Martínez-Casasnovas, J.A. (2001): Teledetección : medio ambiente y cambio global. Universitat de Lleida, 686 pp.