



DEGREE CURRICULUM

# **ADVANCED TECHNOLOGIES OF GEOGRAPHICAL INFORMATION**

Coordination: VERICAT QUEROL, DAMIAN

Academic year 2023-24

## Subject's general information

Subject name	ADVANCED TECHNOLOGIES OF GEOGRAPHICAL INFORMATION			
Code	101154			
Semester	2nd Q(SEMESTER) CONTINUED EVALUATION			
Typology	Degree	Course	Character	Modality
	Bachelor's Degree in Geography	3	COMPULSORY	Attendance-based
Course number of credits (ECTS)	6			
Type of activity, credits, and groups	Activity type	PRACAMP	PRALAB	TEORIA
	Number of credits	1	3	2
	Number of groups	1	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 and field work.</p> <p>Field Work: A total of 3 mandatory field sessions will be held. The number of field trips may be affected depending on the availability of hours for each session. These sessions will be held on Wednesdays, prior agreement with the students and ensuring that there is no overlap with activities from another subject.</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, specifically, 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>3. The subject can be developed in person or virtually depending on the limitations or restrictions that may be imposed by the competent bodies (Universitat de 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. If field sessions cannot be held, they will be replaced by theoretical classes in which the techniques and methods will be explained based on specific presentations.</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. Presentation and Introduction (0.6 credits)
  - a. Presentation of the subject
  - b. Presentation of the field work and practical exercises
  - c. Geographic Information (GI): key aspects and current challenges
2. LiDAR: more than 2D (0.4 credits)
3. Integration of tools for the creation of GI: from the image, the map, the data ... to the evolutionary study and cartographic representation (0.8 credits)
  - a. Image classification: general aspects
  - b. Supervised and automatic image sorting
  - c. Land use mapping
  - d. Changes in land uses: calculations and cartographic representation
4. Creation, dissemination and publication (web) of cartographic products (0.4 credit)
  - a. GIS Cloud: data and geographic products in the cloud
  - b. Creation of interactive dashboards and management of geographic data in the cloud
5. Acquisition of Geographical Information: theoretical aspects and field work (1.2 credits)
  - a. Acquisition of discrete data through topographic equipment: Optical Level, Total Station and rtk-GNNS
  - b. Acquisition of discrete data through mobile applications
  - c. Obtaining digital photographs for 3D modelling: Digital Photogrammetry
6. Post-process of Geographic Information acquired in the field (1.2 credits)
  - a. Data export: key aspects to take into account
  - b. Creation of vector files based on field data
  - c. Preparation of cartography
  - d. Extraction of 3D models using digital photographs
- 47 Google Earth (0.6 credits)
  - a. Preparation, import and export of information to Googel Earth
  - b. Adding images overlays
  - c. Creation of polygons and routes/tracks
  - d. Preparation and export of videos
  - e. Google Earth Engine
- Preparation of Projects in the classroom (0.8 credits)

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 sheet.

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
VERICAT QUEROL, DAMIAN	damia.vericat@udl.cat	6	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. Introduction to GISCloud applications
2. Application of different basic techniques to acquire topographic data in the field
3. Application of different basic techniques to acquire 3d point clouds
4. Data post-processing: fundamental aspects
5. Data mining
6. Geographic information on the web: publishing and sharing results
7. Generation of new basic cartographic information for the study and analysis of the territory
8. Designing exercises
9. Resolution of exercises

Specifically, the **learning outcomes** include:

- a. Practice of georeferencing at various levels: in the field and of a cartographic document
- b. Use of thematic mapping programs, both commercial and online
- c. Critical sense in the segmentation of statistical information through intervals
- d. Critical sense in the graphical expression of statistical information
- e. Versatility and adaptability in the use of new cartographic technologies
- f. Use of a remote sensing image processing program
- g. 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. Field Work
5. Specific work outside the classroom by the student
6. Solving doubts through videoconferencing

7. Exercise resolution demonstration videos
8. Recorded classes and tutorials (video) to be able to review contents
9. Creation of forums (Virtual Campus) for the discussion of problems that arise when doing the practical exercises
10. 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, although there will be some theoretical lectures providing general concepts. In these lectures, basic information to help solving the exercises (lab) will be also given. Teachers will demonstrate the tools using practical examples. In addition, there will be demonstration videos to ensure the learning of the tools. Additionally, the students will be able to get their own data. A series of exercises will be carried out in the field to teach the students different methods of acquiring geographical information using topographic equipment and mobile applications. Moreover, the student will receive basic information in relation to some novel methods to obtain point clouds from ground-based photography. This is a subject that is closely related to other subjects of the degree. The learning of the different GIS Cloud applications will be done autonomously by the student.
- The subject can be developed in person or virtually depending on the limitations or restrictions that may be imposed by the competent bodies (Universitat de 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. If field sessions cannot be held, they will be replaced by theoretical classes in which the techniques and methods will be explained based on specific presentations.
- 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. 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 (essential/compulsory)

- Partial Exam (Theory/Concepts). There will be an exam that accounts for 30% 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-chance).

### Practice Block (essential/compulsory)

- Practical Exercises: Continuous evaluation of the exercises carried out during the practical classes (35% of the final mark). 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 in the event that the practices do not obtain a minimum grade of 5, they must be submitted within the recovery period. Failure to attend practice classes could have a penalty on the corresponding practice grade.

### Final Project Block (essential/compulsory)

- Field work, project (document) and presentation of results: 35% of the grade. The field work will allow to obtain information for the development of the Final Project of the Subject (FPS). This project will be in pairs, it will have to be presented in report format and will be presented in class at the end of the semester. To pass the subject, a minimum grade of 5 must be obtained from the FPS. In the case of not passing the FPS, the student will have the right to a second-chance.

## Second-chance

- In the event that the exam, the internship or the PFA do not obtain a minimum grade of 5, they must be retaken within the period set by the faculty. The maximum mark for the practicals or the FPS 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) that will account for 30% of the final grade of the subject, the delivery of the practicals (35% of the grade) and the Final Project of the Subject (PFA). The three tests (examination, practice and PFA) are recoverable.

## Bibliography

Note: these are general references. The Student will receive further lectures and materials in during the subject (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. Disponible a <http://www6.uniovi.es/~feli/pdf/libromdt.pdf>

Quirós, E. (2014): Introducción a la Fotogrametría y Cartografía aplicades a la Ingeniería Civil. Universidad de Extremadura, Cáceres, 139p. Disponible a [https://mascvuex.unex.es/ebooks/sites/mascvuex.unex.es.mascvuex.ebooks/files/files/file/Fotogrametria\\_9788469713174\\_0.pdf](https://mascvuex.unex.es/ebooks/sites/mascvuex.unex.es.mascvuex.ebooks/files/files/file/Fotogrametria_9788469713174_0.pdf)