



DEGREE CURRICULUM
**ADVANCED TECHNOLOGIES OF
GEOGRAPHICAL INFORMATION**

Coordination: VERICAT QUEROL, DAMIAN

Academic year 2021-22

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			
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. There will be a total of 3 mandatory field sessions. These sessions will be held on Wednesdays, with the prior agreement of the students and ensuring that there is no overlap with activities in another subject. These sessions are considered independent to the lectures.</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 this link 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 (0.3 credits)
 - a. Presentation of the subject
 - b. Field work and practical exercises: presentation and dates
 - c. Geographic Information (GI): key aspects and current challenges
 - d. New opportunities in the acquisition of geographic information
 - e. New opportunities in the creation and dissemination of GI and cartographic products

2. Integration of tools for the creation of GI: from the image, the map, the data ... to the evolutionary study and cartographic representation (0.7 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

3. Google Earth (0.5 credits)
 - a. Preparation of cartographic information with ArcMap
 - b. Import and export of information to Google Earth
 - c. Adding images overlays
 - d. Creation of polygons and routes/tracks
 - e. Preparation and export of videos

4. Acquisition of Geographical Information: theoretical aspects and field work (2 credits)
 - a. Acquisition of discrete data through topographic equipment: Optical Level, Total Station and rtk-GPS
 - b. Acquisition of discrete data through mobile applications: IGN Maps
 - c. Obtaining digital photographs for 3D modelling: Digital Photogrammetry

5. 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

6. Creation, dissemination and publication (web) of cartographic products (1.3 credits)
 - a. Preparation of Geographic Information: data base and metadata
 - b. GIS Cloud: data and geographic products in the cloud
 - c. ArcGis Online and Instamaps
 - d. 3D models on the web
 - e. Integration and dissemination of the results of our projects: use of simple tools (Google Sites) and specific tools (ArcGIS Story Maps; Google Earth Projects)

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	4,8	Agree date and time by mail: face-to-face or virtual.
VILLE , FANNY COLETTE	fanny.ville@udl.cat	1,2	

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.

- (CE11) 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.
- (CE12) 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

1. Presentation and Introduction (0.3 credits)
 - a. Presentation of the subject
 - b. Field work and practical exercises: presentation and dates
 - c. Geographic Information (GI): key aspects and current challenges
 - d. New opportunities in the acquisition of geographic information
 - e. The LiDAR systems: more than 2D data
 - f. New opportunities in the creation and dissemination of GI and cartographic products
2. Integration of tools for the creation of GI: from the image, the map, the data ... to the evolutionary study and cartographic representation (0.7 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
3. Google Earth (0.5 credits)
 - a. Preparation of cartographic information with ArcMap
 - b. Import and export of information to Google Earth
 - c. Adding images overlays
 - d. Creation of polygons and routes/tracks
 - e. Preparation and export of videos.
 - f. Google Earth Engine
4. Acquisition of Geographical Information: theoretical aspects and field work (2 credits)
 - a. Acquisition of discrete data through topographic equipment: Optical Level, Total Station and rtk-GPS
 - b. Acquisition of discrete data through mobile applications: IGN Maps
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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 mapatones 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 subject 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:

1. Exams (Theory / Concepts): 30% of the grade. It is necessary to pass the exam to be able to take into account the note of the practices. In the case of not passing the theoretical exam the student will have the right to a second exam. The exams will be conducted in person if possible, if not, these will be conducted through the Testing and Qualifications tool in the Virtual Campus. There will be a reasonable time to complete the exam. If it is detected that the answer has been copied directly from the notes or from some other source, the question score will be negative. If it is detected in a new question it will be considered plagiarism and the exam will be suspended.
2. Practices (Practical Work): Continuous evaluation of the exercises (a total of around 10 practises, 70% of the grade). Each exercise must be overcome with a minimum grade of 5 (over 10). In the case that the practices do not obtain a minimum grade of 5, or are not delivered within the established deadline, they must be delivered the day of the second-chance exam.
3. Second exam (second-chance): In the case that the exams or the practices do not obtain a minimum grade of 5, the student will have the right of a second chance. In the case of the exam, the same procedure will be followed as mentioned above (point 1).
4. Any attempt to plagiarize will automatically lead to not passing the course

Note: Students who combine their degree with a full time job have the right to ask for alternative assessment within 5 days after the beginning of the semester. For information, please send an e-mail to academic@lletres.udl.cat or ask for information at the Faculty's office (Secretaria de la Facultat de Lletres).

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 aplicadas 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