DEGREE CURRICULUM
GIS / TELEDETECTION

Coordination: VERICAT QUEROL, DAMIAN

Academic year 2022-23

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

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
Teaching load distribution between lectures and independent student work	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. 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. 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.
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.

GIS / TELEDETECTION 2022-23

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 multiespectral 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

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.

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 studnets 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 (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. 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:

- Exams (Theory / Concepts): 40% 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.

- Practices (Practical Work): Continuous evaluation of the exercises (a total of around 10 practises, 60% of the grade). Each exercise has to 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. Each exercise will have a delivery date, a mandatory date for students with continuous assessment. Even so, it is also possible to hand in all the practices together on the day of the final exam (in the latter case the maximum grade will be 5; only for students with continuous assessment).

- Any attempt to plagiarize will automatically lead to not passing the course

- 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). The maximum grade for the practices in this case cannot be higher than 5.

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 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 dmacs núm. 25. Modelos digitales de terreno: estructuras de datos y aplicacions en análisis de formas del terreno y en edafología. Dempartament de Medi Ambient i Ciències del Sòl. Universitat de Lleida. 55p. Available at

http://web.udl.es/dept/macs/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.