Universitat de Lleida

DEGREE CURRICULUM

TOPOGRAPHY, GIS AND REMOTE SENSING

Coordination: MARTINEZ CASASNOVAS, JOSE ANTONIO

Academic year 2023-24

TOPOGRAPHY, GIS AND REMOTE SENSING 2023-24

Subject's general information

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<tr><td>Subject name</td><td>TOPOGRAPHY, GIS AND REMOTE SENSING</td></tr>
<tr><td>Code</td><td>102424</td></tr>
<tr><td>Semester</td><td>1st Q(SEMESTER) CONTINUED EVALUATION</td></tr>
<tr><td>Typology</td><td>
<table>
<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Bachelor's Degree in Forest Engineering</td><td>2</td><td>COMPULSORY</td><td>Attendance-based</td></tr>
<tr><td>Double degree: Bachelor's degree in Forest Engineering and Bachelor's degree in Nature Conservation</td><td>2</td><td>COMPULSORY</td><td>Attendance-based</td></tr>
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<tr><td>Course number of credits (ECTS)</td><td>6</td></tr>
<tr><td>Type of activity, credits, and groups</td><td>
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<tr><th>Activity type</th><td>PRACAMP</td><td>PRALAB</td><td>TEORIA</td></tr>
<tr><th>Number of credits</th><td>0.4</td><td>2.4</td><td>3.2</td></tr>
<tr><th>Number of groups</th><td>3</td><td>2</td><td>1</td></tr>
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<tr><td>Coordination</td><td>MARTINEZ CASASNOVAS, JOSE ANTONIO</td></tr>
<tr><td>Department</td><td>ENVIRONMENT AND SOIL SCIENCES AND CHEMISTRY</td></tr>
<tr><td>Teaching load distribution between lectures and independent student work</td><td>Hores presencials: 60
Hores no presencials: 90</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>Català: 70
Castellà: 30</td></tr>
<tr><td>Distribution of credits</td><td>Topografia: 2,5
SIG i Teledetecció: 3,5</td></tr>
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TOPOGRAPHY, GIS AND REMOTE SENSING 2023-24

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
LLORENS CALVERAS, JORDI	jordi.llorens@udl.cat	3,9	
MARTINEZ CASASNOVAS, JOSE ANTONIO	joseantonio.martinez@udl.cat	3,5	
SANDONIS POZO, LEIRE	leire.sandonis@udl.cat	1,8	

Subject's extra information

Subject / subject in the whole curriculum

The subject is included in the module common to the forestry branch of the Degree in Forestry Engineering, forming part of the field Forestry Engineering. It is a basic subject in which techniques and methods for the representation and spatial analysis of the terrain and territory (in the broadest sense) are taught, which will have the ultimate purpose of being applied to solve problems of planning and management of the territories

Specifically, **Topography** is the science that studies the set of principles and procedures that aim at the graphic representation of the surface of the Earth, with its forms and details, both natural and artificial (planimetry and altimetry). This representation takes place on flat surfaces, limiting itself to small extensions of land, using the denomination of geodesy for larger areas. **Remote sensing** is the science that includes the detection, identification, classification and analysis of vegetation coverings, land uses and phenomena that occur on the earth's surface through remote sensors installed on aerial or space platforms. For its part, **Geographic Information Systems (GIS)** constitute the science and technology oriented to the management, consultation, updating, analysis and modeling of the territorial information generated through topographical and / or remote sensing methods in a way integrated

Currently, both **Topography, GIS and Remote Sensing** are based on the management of specific computer equipment and programs. The use of these technologies is of great interest and application in other subjects of the degree, in particular the relationships with the cartography of land uses and vegetal covers, management of forest systems, territorial and environmental planning, forest fires, reforestation, analysis of changes in vegetation cover, landscape analysis, environmental impact assessment, or hydrological analysis of basins, among others.

In summary, the basic descriptors of the subject are: Topography. Planimetric and altimetric elevations, Replacements and leveling. Calculation of surfaces. Remote sensing Physical fundamentals of remote sensing. Techniques for data acquisition by remote sensing. Digital image process. Geographic Information Systems. Structures of data in GIS (Vectorial and Raster). Spatial analysis of territorial information.

Requirements to take it Prerequisites: There are no prerequisites. Core requirements: There are no core requisites.
It is necessary to have basic knowledge of the use of computers and computer programs, as well as the English language at the level of reading and understanding.

Learning objectives

Knowledge objectives. Understand and demonstrate knowledge in:

- The role of Surveying, GIS and Remote Sensing in the acquisition, processing and analysis of the territory's information with the purpose of inventory, planning and management.
- Concepts and methods for the realization of planimetric and altimetric surveys, replanting, leveling and calculation of surfaces.
- The physical bases of Remote Sensing, its advantages and limitations in studies on the territory.
- The techniques of image analysis (visual interpretation and digital processing).
- Data models in GIS.
- The techniques and functions of GIS analysis for the resolution of particular cases in the territorial analysis.
- The main sources of complementary information and other resources related to these technologies of geographic information and its application.

The student that exceeds the subject will have to be able to:

- Carry out planimetric and altimetric surveys, replanting, leveling and calculation of surfaces.
- Know how to apply knowledge about data structures in the representation of the territory information in the creation of geographic databases.
- Define and apply the techniques for the analysis of remote sensing images (visual interpretation and digital processing) and geographic information analysis techniques and functions through GIS programs, for the resolution of particular cases of planning, analysis and forest management.
- Solve problems posed, oriented to the planning and management of forest resources through the application of integrated remote sensing and GIS techniques, and know where to acquire additional knowledge related to the subject.
- Prepare and present the thematic mapping resulting from the processes of analysis of geographic information as an element of communication in planning and management of the territory.

Competences

CB1. That students have demonstrated to possess and understand knowledge in an area of study that starts from the base of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that imply knowledge from the cutting edge of your field of study

CB2. That students know how to apply their knowledge to their work or vocation in a professional way and possess the competencies that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.

CB3. That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include reflection on relevant issues of a social, scientific or ethical nature

CB4. That students can transmit information, ideas, problems and solutions to both specialized and non-specialized audiences

CB5. That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy

CG9. Knowledge of hydraulics, construction, electrification, forest roads, machinery and mechanization necessary both for the management of forest systems and for their conservation.CG13. Ability to design, direct, prepare, implement and interpret projects and plans, as well as to write technical reports, recognition reports, evaluations, expert opinions and appraisals.

CT5. Apply the gender perspective to the functions of the professional field.

CEMC6. Ability to know, understand and use the principles of Topography, Geographic Information Systems and Remote Sensing.

CEMC9. Ability to know, understand and use the principles of forestry machinery and mechanization.

CEMC17. Ability to know, understand and use the principles of Methodology, organization and project

management.

Subject contents

Module 1: TOPOGRAPHY (prof. Jordi Llorens)

Item 1. GENERAL NOTIONS.

Item 2. CARTOGRAPHY.

Item 3. GLOBAL POSITIONING SYSTEMS (GNSS).

Item 4. TOPOGRAPHIC INSTRUMENTS.

Item 5. PLANIMETRIC AND ALTIMETRIC METHODS.

Item 6. DIGITAL LAND MODELS (MDT).

Item 7. PHOTOGRAMETRY.

- Practice 1 (Computer Room): Work with digital cartography: superposition and georeferencing of images. Get to know digital cartographic platforms for information.

- Practice 2 (Field): Carry out the relevant operations for the installation of topographic devices.

- Practice 3 (Computer Room): Work with digital information to complement the topographic survey.

- Practice 4 (Field): Work with electronic distance meter and data collection necessary for lifting points. Stakeout.

- Practice 5 (Computer Room): Digitization of field data and georeferencing of points until the construction of the digital terrain model (MDT).

Module 2: GEOGRAPHICAL INFORMATION SYSTEMS AND REMOTE SENSING (profs. J.A. Martínez Casasnovas, Leire Sandonís Pozo)

Item 1. INTRODUCTION AND CHARACTERISTICS OF GEOINFORMATION

Practice 1. Introduction to GIS progrmas, and visualization of geographic information

Topic 2. THE VECTOR MODEL

Practice 2. Attribute tables and selection queries in vector layers

Practice 3. Creation and editing of vector layers

Topic 4. THE RASTER MODEL

Practice 4. Geoprocessing operations with vector data

Practice 5. Main characteristics of the raster model

Item 4. DIGITAL ELEVATION MODELS

Practice 6. Digital elevation models. Creation and extraction of topographic and hydrological information

Item 5. INTRODUCTION AND ELECTROMAGNETIC ENERGY

Practice 7. Visualization and characteristics of multispectral images

Item 6. SPECTRAL SIGNATURES

Item 7. EXPECTAL INDEX AND VEGETATION INDEX

Practice 8. Spectral signatures and vegetation index

Item 8. CLASSIFICATION OF MULTISPECTRAL IMAGES

Practice 9. Classification of multispectral images

Methodology

The subject is structured according to different items with the following weighting:

- Part Topography: 37% of the subject. It corresponds to 37% of the final grade.
- GIS and remote sensing parts: 63% of the subject. It corresponds to 63% of the final grade.

According to the program, the subject consists of theoretical lessons, on basic concepts and some more advanced ones; and practices that can be field or classroom with computer programs. Specifically, the summary of the activities and hours of classes to be taught in each part are:

- Presentation and introductory topics: 2 hours
- Topography theoretical classes: 14 h
- Topography practical classes:
  - Field practices: 4 h
  - Classroom practice with computer programs: 6 h
- SIGTEL theoretical classes: 16 h
- SIGTEL practice classes: 18 h

Classes are face-to-face. Although there is the possibility of requesting the alternative assessment in the terms determined by the assessment regulations of the University of Lleida.

Development plan

According to the calendar and schedule established by the Directorate of Studies of the ETSEA and the program that will appear on the virtual campus of the subject with the detailed calendar of activities (classes and practices).

Evaluation

PARTS OF THE SUBJECT AND WEIGHT IN THE GLOBAL MARK:

The final mak of the subject will be calculated according to the following weighting
(Topo Exam x 7 + Topo Practice x 3) x 0.37 + (SIGTEL Exam x 6 + Practice Continuous Assessment x 1.59 + Practice Exam x 2.41) x 0.63

Weight of each evaluation item (out of 100):
• BLOCK 1 Exam Topography ***: 25.9
• BLOCK 2 Practice Topography: 11.1
• BLOCK 3 SIGTEL Exam ***: 37.8
• BLOCK 4 SIGTEL practices: 25.2. This block consists of two parts: Implementation and continuous evaluation of the practices (10.0%) and Practice exam *** (15.2%)

For the BLOCKS marked with ***, a minimum grade is required to pass the subject. Thus, it is required to obtain a grade equal to or greater than 5 in the Topography Exam, the SIGTEL Exam and the SIGTEL Practice Exam. If you get a grade lower than 5 in any of these BLOCKS, you can make it up when the corresponding make-up exam is called. In the event that any of these parts is ultimately suspended, the subject is suspended as a whole.

SPECIFIC FEATURES OF THE EVALUATION:

• THEORETICAL PART: To pass the subject a minimum grade of 5.0 must be obtained in each of the parts. One part does not compensate for the other. For example, getting a grade of 4 in Topography and 6 in SIGTEL, or vice versa, does not mean that the average is 5.0. In this case, it would mean that the Topography part has been suspended, and if this is the final mark, also that the subject has been suspended, since one of the requirements has not been met. This is independent of the practice grade. In other words, the practices do not count until the previous minimum requirement is met.

- PRACTICAL PART:

- **TOPOGRAPHY practices**:

• Completing and submitting the reports and data of all practical exercises (5) is essential to achieve the practical contents of topography. The field practices (Practice 2 and 4) are mandatory. Practices must be submitted within the established deadlines. If you are unable to attend a practice, you must justify this to the teacher (prior to carrying out the practice) and an alternative solution will be sought. If necessary, this solution will involve a specific exam on the use of topographical equipment to be carried out on the day of the exam for this part of the subject.

- **SIGTEL practices**:

They consist of the practice and the practice exam.
• A) continuous evaluation of exercises. This part is not a requirement to pass the subject, but it is to acquire the practical knowledge necessary to pass the practice exam. The assessment will be carried out by attending the practices and completing a questionnaire on concepts related to the corresponding exercise. This quiz will be done using the Tests/Questionnaires tool of the subject's Virtual Campus. Only the practices attended will be counted. The grade will be calculated according to the result of the corresponding questionnaire.
• B) individual practical exam at the end of the SIGTEL part there will be a practical exam, which is a requirement to pass the subject. This exam will be done on a computer, in a computer room and will consist of a combined exercise of the application of SIGTEL tools and resources seen in the practice classes.
In the event that the student does not obtain the minimum required grade established in some of the essential evaluation blocks (marked with ***), but the average of the subject is approved, the subject will be graded in the minutes with a 4.9 (suspension).

- **RE-TAKE EXAMS**: In the re-take exams of any of the parts, the maximum grade that can be achieved will be 7.0, regardless of whether the exam grade is higher than 7.0.

ALTERNATIVE ASSESSMENT:
In order to facilitate work or family reconciliation, the student who wishes to do so has the right to waive the continuous assessment at the beginning of each semester and to carry out an alternative assessment in the terms established by the assessment regulations from the University of Lleida.
The alternative assessment will consist of the following BLOCKS and assessment tests:
• TOPOGRAPHY: Theory exam + completion of 2 field practices (37% of the final grade)
• SIGTEL: Theory exam (37.8% of the final grade) + Practical exam (25.2% of the final grade)
All these items of the alternative assessment are essential to pass the subject, having to obtain a minimum grade of 5 in each part to pass the subject overall.

PARTS THAT ARE SAVED FOR LATER COURSES:
If you have to repeat the course, the notes of the approved parts, both theory and practical, will be kept. In the case of SIGTEL internships, they will be saved whenever and wherever the internship exam has been passed. The following year is required, even if a student has passed the practicals of the previous year, he/she will have the right to do the practicals again and the grades that will be recorded will be those of the course he/she is taking and not those of the previous one. All approved parts will only be kept during the following academic year in which they have been approved. Thus, in the event of having to repeat the subject a third year, the parts passed two years earlier will no longer be saved and the entire assessment will have to be repeated.

COPIES: It will be apply what is indicated in the general evaluation regulations of the University of Lleida

(https://www.udl.cat/export/sites/universitat-lleida/ca/udl/norma/.galleries/docs/Ordenacio_academica/Acord-187-CG-29.6.2023-Amendment-normative-evaluation-and-qualification-Graus-i-Masters-revisada-SL.pdf).

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Complementary

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- **https://www.icgc.cat/**

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