Universitat de Lleida

DEGREE CURRICULUM

DIGITAL TECHNOLOGIES FOR FOREST PLANNING

Coordination: MARTÍNEZ CASASNOVAS, JOSÉ ANTONIO

Academic year 2021-22

Subject's general information

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<tr><td>Subject name</td><td>DIGITAL TECHNOLOGIES FOR FOREST PLANNING</td></tr>
<tr><td>Code</td><td>103038</td></tr>
<tr><td>Semester</td><td>2nd 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>Master's Degree in Forestry Engineering</td><td>1</td><td>COMPULSORY</td><td>Blended learning</td></tr></table></td></tr>
<tr><td>Course number of credits (ECTS)</td><td>8</td></tr>
<tr><td>Type of activity, credits, and groups</td><td><table><tr><th>Activity type</th><td>PRACAMP</td><td>PRALAB</td><td>TEORIA</td></tr><tr><th>Number of credits</th><td>1.4</td><td>3.4</td><td>3.2</td></tr><tr><th>Number of groups</th><td>1</td><td>1</td><td>1</td></tr></table></td></tr>
<tr><td>Coordination</td><td>MARTÍNEZ CASASNOVAS, JOSÉ ANTONIO</td></tr>
<tr><td>Department</td><td>ENVIRONMENT AND SOIL SCIENCES</td></tr>
<tr><td>Teaching load distribution between lectures and independent student work</td><td>Training activity Hours allocated to training activity Percentage of attendance
- Master class 32 100
- Case study 34 30
- Off-campus activities 14 100
- Personal work 120 0</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>Catalan and Spanish</td></tr>
<tr><td>Distribution of credits</td><td>- Master classes (teory): 3.2 ECTS
- Case studies (practical): 3.4 ECTS
- Off-campus activities: 1.4 ECTS</td></tr>
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Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
AMÉZTEGUI GONZÁLEZ, AITOR	aitor.ameztegui@udl.cat	1,6	
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Subject's extra information

The subject Digital Technologies for Forest Planning is proposed as an advanced complement to the contents of subjects studied in the degree with the aim of teaching basic aspects for the acquisition of data and geographical or territorial information such as, for example, Topography, Geographic Information Systems and Remote Sensing. Thus, the student who passes this subject, will have the necessary learning in terms of current and historical digital cartographic data and information sources, both locally and more globally, to be used for the resolution of case studies, studies and forest planning projects. At the same time, they will gain basic knowledge of advanced techniques and technologies for the acquisition of 3D data using drones and automated digital photogrammetry, and ground and air LiDAR; all of which are very useful in making inventories and for forest planning.

With the learning outcomes the student will understand the role of digital technologies in the different phases of forest planning, from the acquisition of data, both from existing information and from new information obtained. in the field through the application of different techniques and technologies, until its use through specific data processing and analysis programs for use in practical planning cases.

You will also need to be able to plan and execute forest planning case studies / case studies using the various technologies related to the acquisition and analysis of data from different sources.

Learning objectives

The main objective of the Digital Technologies for Forest Planning Assignment is to complement the basic training on digital technologies for geographic information (Topography, Geographical Information Systems and Remote Detection) in forest applications and planning, advanced methodologies for to the acquisition of 3D data mitjançant drones and automated digital photogrammetry, and terrestrial LiDAR and aeri.

Specifically, the specific objects are:

- I connect and understand the paper of digital technologies in the different phases of forest planning, from the acquisition of data, both from information to existing, and from new information obtained from camp mitjançant the application of different techniques and technologies
- Acquire connections and skills in the use of equipment and specific programs for the acquisition, tractament and data analysis per seu ús in practical cases of forest planning and study.
- Execute studies / practical cases of forestry planning utilizing the various technologies related to the acquisition and analysis of data from different sources.

Competences

Basic competences:

B06 Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
B07 That students know how to apply the knowledge acquired and have the ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
B08 That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of their knowledge and judgments.
B09 That students know how to communicate their conclusions –and the knowledge and ultimate reasons that support them– to specialized and non-specialized audiences in a clear and unambiguous way.
B010 That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous

General competences:

CG2 Design, write, direct, elaborate, implement and interpret projects and plans in the forest and natural environment.
CG7 Develop forestry policies.

Specific competences:

CE5 Design plans for the comprehensive sustainable development of forest regions and the development of management indicators.
CE7 Design Planning Plans for the Territory, Mountain Areas and Coastal Zones.
CE8 Design hydrological plans and plans to combat desertification.

Subject contents

1. Types and sources (digital repositories) of forest information. National Forest Inventory (IFN2, IFN3, IFN4): design and characteristics. Inventory data processing tools (IFNApp, Catalan Forestry Laboratory, Forestry Explorer). Data Sources: ICGC / IGN, Biophysical Variables, GFBI-Hub, Soil and Soil Covers (SIOSE, MFE, SoilGRID), Climate Data (Meteoland, ERA-5, Worldclim, EuMedClim). Case studies of application (calculation of stocks and carbon stock based on data from national forest inventories).

2. Geographic Information Systems. Case studies of the application of GIS in Forest Planning and based on WEB Map Servers.

3. Remote sensing.

- Multispectral remote sensing. Satellites and sensors of interest in forestry applications (Landsat, Modis, Sentinel). Practical cases of application (mapping of the burned area and severity of forest fires; multitemporal analysis of the regeneration of natural vegetation after fire, etc.).
- Drones and Automated Digital Photogrammetry. Legislation and regulations. Structure from Motion and Multiview Stereo (SfM-MVS) algorithms. Obtaining photographs with multiple platforms. Data processing: software, obtaining orthophotomaps and 3D point clouds. Creation of MDS and MDT. Cases of application to forest planning: determination of damage caused by pests, application of SfM-MVS to the reconstruction of historical and contemporary photographs; combination of data obtained from land (sampling, LiDAR) with SfM-MVS data for the study of forest masses).

4. Uses and applications of LiDAR technology. LiDAR air. Fundamentals of LiDAR technology. PNOA and ICGC flights. Applications to forest management. Case studies of application to forest planning (design of a forest inventory with LiDAR).

- LiDAR air. Fundamentals of LiDAR technology. PNOA and ICGC flights. Applications to forest management. Case studies of application to forest planning (design of a forest inventory with LiDAR).
- LiDAR terrestrial. Characteristics and types of terrestrial LiDAR. Design of protocols for obtaining data (control networks). Processing of point clouds (3D topographic information and data extraction). Practical cases of application (evolutionary study of surfaces subject to disturbances: erosion and sedimentation; volumetric changes due to the extraction of materials; reconsideration of field plots with LiDAR).

Methodology

The classes of the subject will consist of different types of activities, according to the work plan that will be detailed at the beginning of the course:

- Theoretical classes
- Practical classes
- Study and teamwork
- Study and individual work
- Seminars
- Tutorials

Development plan

The development plan for the face-to-face sessions will be as follows. Each session will last two hours, except for the field trip which will be for an entire morning. The sessions will coincide with the calendar established in the Master's program.

1. Presentation of the subject and presentation of a case study.
2. Data Sources and GIS Practice characterization of the study area. Data download and elaboration of layers, DEM, slope, etc.
3. Data Sources and GIS Practice characterization of the study area. Perimeter and information regarding the fire.
4. Sources of information - Forest inventory.
5. Practice on forest inventory.
6. Review concepts Remote sensing.
7. Practice Remote sensing characterizing vegetation before and after fire. Calculation of vegetation and NBR indices. Severity index.
8. Practice Remote sensing characterizing vegetation before and after fire. Continued. Google Earth search.
9. Integration of results: comparison of severity with pre-fire inventory and with post-fire evolution.
10. LiDAR aerial: data download and processing.
11. Aerial LiDAR: data download and processing. Continued.
12. Resolution of doubts and presentation of the field trip. LiDAR terrestrial and drone technical explanation.
13. Field trip. Drone flight and LiDAR data acquisition.
14. Concepts on erosion risk mapping.
15. Practice GIS erosion risk mapping (before and after difference)
16. Actual erosion from drone multitemporal DEMs and comparison with actual erosion.
17. LiDAR terrestrial.
18. Integration of information for forest planning.
19. Integration of information for forest planning. Continued.

Evaluation

- Individual written exercises (continuous assessment practice reports): 30% of the mark.
- Case study (report by groups, to be determined according to the number of students enrolled in the subject): 50% of the grade.
- Case study presentation (by groups but individual evaluation): 20% of the mark.

In the first two parts you must obtain a grade equal to or greater than 5 points out of 10 to pass the course. The evaluation of the individual exercises (practice reports) is continued. In case of suspension of the final report of the case study, the opportunity will be given to review it and the maximum grade that can be obtained will be specified.

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