Course Teaching Guide

Course	GEOGRAPHICAL INFORMATION SYSTEMS AND GEOSPATIAL ANALYSIS		
Subject area			
Module	OPTATIVE		
Degree	Máster en Gestión Forestal basada en Ciencia de Datos - Forest Management based on Data Science & Master in Mediterranean Forestry and Natural Resources – MEDFOR		
Curriculum	572/506	**Code**	54278/53029
When taught	1st Quarter	**Type/Category**	ELECTIVE
Level/Cycle	MASTER DEGREE	**Year**	1º/2º
ECTS Credits	6 ECTS		
Language of instruction	English		
Lecturer/s in charge	*pending*		
Contact details (e-mail, telephone no.…)			
Tutorial hours	See at www.uva.es > Masteres >Título correspondiente>Tutorías		
Department	INSTITUTO UNIVERSITARIO DE INVESTIGACIÓN EN GESTIÓN FORESTAL SOSTENIBLE (iuFOR)		

1. Situation /Relevance of the Course

1.1 Contextualisation

Although thematic maps are becoming easily available, frequently, foresters and GIS specialists have to elaborate by themselves specialized maps of some variable of interest. Examples may include maps of average annual precipitation or average stand density, which are judged necessary for decision making in land management. These types of maps are not directly available in the web or in specialized databases but, instead, may be constructed using different sorts of information (LiDAR datasets, ground based forest inventories, meteorological data, …) Spatial point pattern analysis and geostatistics provide a set of tools that can be used to construct such thematic information.

1.2 Relation with other subject areas

This course is closely related with Modelización Forestal y Ambiental (DATAFOREST).

1.3 Pre-requirements

None

2. Skills

2.1 General

Following the Dublin Descriptors, students of this course must:

i) have demonstrated knowledge and understanding that is founded upon and extends and/or enhances that typically associated with Bachelor's level, and that provides a basis or opportunity for originality in developing and/or applying ideas, often within a research3 context;
ii) can apply their knowledge and understanding, and problem solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study;
iii) have the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete or limited information, but that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgements;
iv) can communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously;
v) have the learning skills to allow them to continue to study in a manner that may be largely self-directed or autonomous.

2.2 Specific

With this course, students will acquire the following specifics skills:

E11 Capacidad para buscar, seleccionar, generar y manejar bases de datos adecuadas para obtener información relevante para los problemas de la gestión forestal/ Ability to search, select, generate and manage adequate databases to obtain information relevant to forest management problems.
E12 Capacidad para la comprensión y desarrollo de aplicaciones relacionadas con la gestión de datos de sistemas forestales/Ability to understand and develop applications related to the management of data from forest systems.

3. Aims

Students will be able to design, manage and apply techniques on (i) Geographical Information Systems, (ii) Spatial Statistics and (iii) Spatial pattern analysis.

4. Thematic blocks[1]

Block 1:

Work load in ECTS credits: 6

a. Contextualisation and justification

See course context

b. Learning objectives

See course objectives

c. Content

FOUNDATIONS

- Introduction to spatial data analysis
- GIS principles and QGIS foundations
- Introduction to R software
- Visualizing and exploring data (with R)
- Classes for Spatial Data in R
- Principles of LiDAR and Airborne Laser Scanning (ALS)

DATA GATHERING

- Importing data in R and QGIS
- Georeferencing maps with QGIS
- ALS-based Forest inventory: Area Based (ABA), Enhanced Area based (EABA) approaches and Individual tree detection methods (ITD)
- TLS-based Forest inventory

DATA ANALYSIS

- QGIS forestry related tools: Digitizing and updating forest stands
- ALS-based forest management planning: cell based vs segment based forest planning
- Modelling: stand level models with ALS data
- Basic Knowledge in Spatial Statistics and Spatial Point Patterns
- Geostatistics
- Spatial Regression Models

CASE STUDIES

- Tree size and species mingling
- Monitoring changes:
- Systematic sampling of forest stands
- Forest stands maps

d. Method of teaching

A combination of theory, problems, and seminars jointly with independent study and group study will be used. Practical sessions are conducted using either GIS software, R statistical software and specialized LiDAR software.

e. Work plan

Classes will take place during the last 5 weeks of the first semester according with published schedule. Classroom will be determined yearly. Depending on the year, invited speakers could deliver invited seminars.

f. Assessment

Course requirements include active participation (10%), the presentation of a class summary (10%), a class project (30%) and a final exam (50%).

g Didactic resources

g.1 Basic references

Bivand , R.,S., Pebesma, E., Gómez-Rubio, V. 2013. Applied Spatial Data Analysis with R Second Edition Springer 405 pages

Hastie, T., Tibshirani, R. 2015 An introduction to statistical learning with applications in R. Springer 426 pag. http://statweb.stanford.edu/~tibs/ElemStatLearn/

Wiegand, T. and Moloney, K. 2014. Handbook of spatial point pattern analysis in Ecology. CRC Press, 510 pages

g.2 Complementary references

Jones, O., Maillardet, R., Robinson, A. (2009). Introduction to scientific programming and simulation using R. CRC Press, 453 p.

g.3 Other online resources (píldoras de conocimiento, blogs, videos, revistas digitales, cursos masivos (MOOC), …)

h. Resources needed

No special resources needed

i. Timing

Workload in ECTS	Period
6 ECTS	final 5 weeks of the first semester

5. Didactic methods

Lectures, field trips, writing assessment and on field discussions.

6. Table of student's dedication to the course

ONSITE ACTIVITIES	HOURS	OFFSITE ACTIVITIES	HOURS
Theory	20	Individual study	60
Practical work (Problems,…)	10	Group study	30
Labs	20		
Field trips			
Seminars	8		
Groups meetings			
Evaluation	2		
Total onsite	**60**	**Total offsite**	**90**
		TOTAL	**150**

7. System characteristic of the evaluation

INSTRUMENT/PROCEDURE	WEIGHT IN THE FINAL MARK/GRADE	REMARKS
Activity dossier	10 %	
Class projects	50 %	
Active participation in the course	10 %	
Final exam	30 %	Theory questions (test and short questions) and problems resolution

GRADING CRITERIA

- **First call (*Convocatoria ordinaria*):**
  The final grade will be the sum of the partial grades weighted according to the previous table. It is compulsory to obtain at least a 5 in the exam.

- **Second call (*Convocatoria ordinaria*):**
  Students can present the Project (for the first time or with improvements) and must take the exam again. The final grade will be the sum of the partial grades weighted according to the previous table. It is compulsory to obtain at least a 5 in the exam.

8. Important remarks

Plagiarism is not allowed. Students failing in plagiarism will get a 0 (zero) in the call and the University will be informed for academic punishment.