Universitat Autònoma de Barcelona

2023/2024

Environmental Cartographic Analysis

Code: 100832
ECTS Credits: 6

Degree	Type	Year	Semester
2500251 Environmental Biology	OB	2	2

Contact

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Teaching groups languages

You can check it through this link. To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

Teachers

Joan Pino Vilalta

Prerequisites

There are no prerequisites. However, the emphasis that is made in the analysis and understanding of spatial and temporal distribution of environmental variables makes it advisable for the student to have field and geographical knowledge. Also, computer skills could enhance the understanding during practical classes.

Objectives and Contextualisation

Environmental issues and their management are usually improved when using spatial and temporal perspective. For this reason, this subject aims to provide the student with the basic concepts and tools to deal with maps and analyse or derive new information (modelling) from them. Geographical information systems and remote sensing introductory concepts would provide the students with geospatial-user capabilities. The study cases are usually related to Environmental Biology topics such as vegetation stress, landscape fragmentation, land cover mapping or bioclimatic modelling.

This subject is complementary to the following subjects: Prospecting the natural environment (first contact of the student with environmental cartography and with the analysis of the territory) and Analysis of the vegetation (more conceptual content subject that will take advantage of the cartographic knowledge acquired in this subject).

We can divide the subject into three blocks:

1) Concepts, tools and cartographic databases. Introduction to the basic concepts of cartography, Geographic Information Systems (GIS) and Remote sensing.

2) Management of spatial information using the main GIS tools.

3) Cartographic analysis and modelling. Collection of case studies to present a data processing chain to solve environmental problems.

Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Adapt to new situations.
- Apply ICT resources pertaining to this field of study.
- Carry out services and processes related to environmental biology.
- Catalogue, assess and manage natural biological resources.
- Develop analysis and synthesis skills.
- Interpret and design the landscape.
- Manage information
- Produce thematic cartographies of the natural environment.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.

Learning Outcomes

1. Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
2. Actuar en l'àmbit de coneixement propi avaluant les desigualtats per raó de sexe/gènere.
3. Adapt to new situations.
4. Analyse the components of the natural environment and human influence on the configuration of the different landscapes.
5. Apply ICT resources pertaining to this field of study.
6. Develop analysis and synthesis skills.
7. Differentiate and evaluate the components of the physical and biotic environment, and represent these on maps.
8. Draw maps of distribution, vulnerability, or evaluation of the biotic components.
9. Interpret maps of the natural environment and map the biotic components and their habitats.
10. Manage information
11. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.

Content

1. Concepts and cartographic environments

1.1. Environmental mapping. Users and producers of spatial information. Digital dimension of the map. Composition of maps.

1.2. Introduction to the Geographic Information Systems. Components and functionalities. Models of data and metadata. Basic analysis tools.

2. Cartographic databases

2.1. Cartographic units. Discrete and continuous environmental variables.

2.2. Information sources. Reference and thematic mapping (examples of vector and raster models). Map servers on the Internet.

2.3. Data capture (i): Photointerpretation. Field surveys and global positioning systems (GPS).

2.4. Data capture (ii): Remote sensing. Characteristics of sensors and platforms. Physical principles. Image processing and classification. Quantitative indexes derived from images.

2.5. Data capture (iii): In-situ sensors. Field campaigns and inventories. Citizen science

3. Tools for the management of cartographic information

3.1. Mosaic and clip tools. Reclassification and map algebra. Combination of layers. Change of map projection. Cartographic generalization.

4. Cartographic analysis

4.1. Patterns of distribution of environmental variables and cartographic representation of descriptive statistics.

4.2. Analysis of time patterns.

4.3. Analysis of distances.

4.4. Topographical Spatial Analysis: Digital Elevation Models.

5. Cartographic modelling

5.1. Bioclimatic variables

5.2. Species distribution models

6. Case studies: formulation of GIS protocols to respond to the demands of environmental biology

Practical sessions

1. Introduction to the GIS

2. Photointerpretation and digitalization

3. Territory analysis

4.Management of cartographic information

5. Quantitative vegetation indexes

6. Species distribution models

Methodology

The methodology is based on directed theory lessons complemented with practical directed activities (field survey and computing classroom activities). It is important to note that this subject presents a strong practical component that we consider essential for the learning of theoretical concepts and, at the same time, a good development of the most applied competences. Indeed, the exams will have a strong theoretical-practical component.

Lecturers would provide a practice guide to conduct exercises designed to familiarize the students with GIS and Remote Sensing as critical users. Also, a field survey will be performed to apply photointerpretation techniques to develop land cover maps.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Computing classroom activities	24	0.96	4, 5, 10, 9, 8
Field survey	6	0.24	4, 5, 9, 8
Theory classes	20	0.8	4, 6, 7, 9, 8
Type: Autonomous			
Practical deliveries	50	2	3, 4, 5, 7, 10, 9, 8
Study	47	1.88	4, 5, 6, 7, 10, 9

Assessment

1 / The first exam will include:

• Questions focused on basic and key mapping concepts acquired during the first part of the course. Writing short answers will be required.

2 / The final exam consists of:

• Questions that involve a long writing answer to develop different case study solving problems through GIS & Remote sensing protocols. The student must be able to apply and relate theoretical and practical concepts learned along the course.

The final exam also includes a second-chance assessment of the first exam, both for those who must do it obligatorily (marks less than 4 in the first partial) and for those who want to improve their marks (the final mark will be the higher between both exams). In case you want to raise your grade, you must notify the professors by mail three days in advance.

3/ Practical deliveries

They will be assessed at group level through two deliveries: (i) a map elaborated by photointerpretation of air-borne orthoimages and (ii) a report to analyse the territory and the vegetation of the field survey area. The resultant mark will be the average between both deliveries.

Compensations

A student will obtain the final averaged mark as long as the minimum mark of each of the three assessment activities is equal to or greater than 4. In case of being less than 4, the student will not pass this subject even if

the final averaged mark is higher than 5. Otherwise, a final averaged mark of 5 or more will be required to pass this subject. If any of the three assessment activities is missing, the student will obtain a non-assessable grade.

Class attendance

The attendance to the practices (field survey and computing classroom activities) will be compulsory. Only justified absences could be considered as valid.

Non-continuous assessment

Given that the practices (lab and field survey) are mandatory, they will be able to hand in the report without any problem. Moreover, there are no additional assessment activities. Therefore, this assessment will be identical to the continuous one.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Practicum dossier	40%	0.25	0.01	1, 2, 11, 3, 4, 5, 6, 7, 10, 9, 8
Written exam (1st partial)	30%	1	0.04	3, 4, 6, 7, 10
Written exam (final)	30%	1.75	0.07	3, 4, 6, 7, 10

Bibliography

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CHUVIECO, E. 1991-96. Fundamentos de teledetección espacial. Ed. Rialp. Madrid.

BURROUGH, P. A. & MCDONNELL, R. A.1998. Principles of geographical information system. Oxford University Press. Oxford.

GOODCHILD, M. F., PARKS, B.O. & STEYAERT, L. T. (eds.) 1993. Environmental modeling with GIS. Oxford University Press. New York.

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Software

Miramon 9