VNIVERSITAT DE VALÈNCIA

Course Guide
41053 Techniques for the analysis and processing of geographical information

COURSE DATA

Data Subject	
Code	41053
Name	Techniques for the analysis and processing of geographical information
Cycle	Master's degree
ECTS Credits	14.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
2001 - M.D. in Environmental and Territorial Management Techniques	Faculty of Geography and History	1	First term

Subject-matter

Degree	Subject-matter	Character
2001 - M.D. in Environmental and Territorial Management Techniques	2 - Techniques for the analysis and processing of geographic information	Obligatory

Coordination

Name	Department
IRANZO GARCIA, EMILIO	195 - Geography

SUMMARY

Over the past two decades, geographic information systems have emerged as an essential tool for cartographic editing, and for the management of land and the natural environment. These programs and platforms handle geographical information in various media (conventional mapping, aerial photographs, and satellite images), integrate cartographic and alphanumeric information (databases), and execute various operations of spatial analysis, as well as generating new spatial information.

The use of geographic information systems is therefore essential for the monitoring and analysis of territorial and environmental processes, and for the translation of results to papers and projects within this area.

These systems are a leading tool for territorial diagnosis and analysis, insofar as they permit the use of large amounts of very different types of information (such as physical environment, infrastructure, population, and land use). At the same time, tools of spatial analysis and geostatistics that incorporate GIS

enable the use of innovative and in-depth approaches that would otherwise be unthinkable. Satellites provide a wealth of information for the recognition and assessment of the planet's resources and the processes taking place, and this information is being further extended by the increasing resolution of spectral and spatial imagery.

This subject addresses the application of these methodologies to plans and projects with an environmental dimension, which constitute the key instrument for implementing conservation policies and mitigating impacts, and are an essential element for the development of public policy in this area, with particular attention to protected natural spaces and to the analysis and planning of the landscape.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

None

OUTCOMES

2001 - M.D. in Environmental and Territorial Management Techniques

- Capacidad de percibir y gestionar los problemas ambientales que afectan al territorio considerando las diferentes perspectivas de los actores implicados.
- Capacidad de organización, planificación y gestión de la información ambiental y territorial
- Conocimiento de los fundamentos y marco legal de la ordenación del territorio, de las metodologías e instrumentos de la planificación y de los modelos de desarrollo territorial.
- Manejo de técnicas de análisis y representación cartográfica medioambiental y territorial.
- Técnicas de análisis cuantitativo
- Manejo de Sistemas de Información Geográfica aplicados a los problemas medioambientales y territoriales
- Técnicas de Teledetección espacial

- Capacidad de realizar la planificación territorial: análisis, diagnóstico y propuestas.
- Capacidad de diseño, ejecución, seguimiento y evaluación de proyectos territoriales y estudios de impacto y auditorías ambientales.
- Capacidad de analizar y caracterizar los procesos naturales y de degradación y evaluar las posibilidades de restauración medioambiental.
- Aprender a elaborar catálogos de paisaje y estudios de integración paisajística
- Capacidad de analizar y caracterizar riesgos medioambientales, su prevención, predicción y gestión.
- Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.
- Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.
- Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.
- Students should demonstrate self-directed learning skills for continued academic growth.
- Students should possess and understand foundational knowledge that enables original thinking and research in the field.

LEARNING OUTCOMES

- Production of environmental projects and reports.

- Studies of environmental and territorial issues using GIS.

- Topographic information management and extraction of useful data for land and environmental management.

- Production of landscape analysis.

- Proposals for landscape restoration.

DESCRIPTION OF CONTENTS

1. Basic concepts of cartographic design

Principles of cartographic design: semiology, symbolization, labeling, hyerarchy and lay-out.
Case analysis: characteristics of good maps
Exercises of cartographic expression

2. Remote sensing

Remote sensing concepts and spectral response
Sensors and satellites
Physical principles for remote sensing. Diversity of current sensors and data
Digital images processing. Classification
Development of study case on image processing

3. Techniques for the analysis of environmental and territorial problems with GIS

Obtaining digital elevation models for the analysis of environmental problems
Preparation and analysis of digital elevation models with LiDAR.
Elaboration and analysis of digital elevation models from photogrammetry with SfM-MVS.
Applications of high resolution digital elevation models.
Introduction to spatial statistics with GIS
Raster Model Generation: Description of Interpolation Methods
Geographically weighted regression (GWR). Theory, examples and analysis of results
Modeling using nonparametric estimation

4. Protected natural areas planning

Management processes: Planning, organisation, leadership and control.
Planning for the establishment of protected natural areas.
Planning and management instruments for protected natural areas.
Preparation of management plans.

5. Instruments for landscape management and regulation

Basic concepts for landscape conception: terms and perspectives
The New Culture of Territory and the EU Landscape Convention.
Spanish and Valencian landscape policies (instruments for planning, regulation and management)
Valencia Region landscape instruments: legal framework, Territorial Action Plans, Landscape studies, Landscape Integration studies, proposals and projects for landscape action.

6. Techniques of visualization for landscape interventions

Knowledge and skills in the visualization of the transformations in the landscape. To this end, a seminar on visualization techniques of interventions in the landscape showing practical applications will be given. On this theoretical basis it is deepened in the techniques of visualization with a practice in which the students will learn the basic principles of the accomplishment of 2D computer graphics for actions of requalification of the landscape and landscape integration of activities.

WORKLOAD

ACTIVITY	Hours	% To be attended
Computer classroom practice	54,00	100
Theory classes	10,00	100
Classroom practices	10,00	100
Seminars	6,00	100
Other activities	4,00	100
Tutorials	2,00	100
Study and independent work	100,00	0
Preparation of evaluation activities	64,00	0
Resolution of case studies	100,00	0
TOTAL	**350,00**	

TEACHING METHODOLOGY

The course combines theoretical sessions led by a lecturer with practical exercises for students working inside and outside the classroom.

The goal is for students to independently solve practical exercises with GIS and remote sensing tools, so that the lecturer’s role is increasingly unnecessary. At the end of the course, students will be asked to independently perform a practical application.

In theory classes, fundamental concepts are taught by lecturers – and an analysis and commentary of texts, documents, and plans is made. Texts, documents, and plans will be read individually, in some cases prior to class and in other cases after class, in order to facilitate participation and discussion, as well as any written work.

Students must produce individual written work from readings of texts on aspects of the syllabus.

EVALUATION

The final grade will be based on the following:

- Class attendance (minimum of 80% attendance)

- Short tests at the end of each part of the course (15%)

- Individual written work and practical exercises (85%).

REFERENCES

Basic

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- CHUVIECO, E. (1996): Fundamentos de teledetección espacial, Madrid, Ed. Rialp S.A:
- GÓMEZ ZOTANO, J. Y RIESCO CHUECA. P. (2010): Marco conceptual y metodológico para los paisajes españoles. Aplicación a tres escalas espaciales. Consejería de Obras Públicas y Vivienda. Junta de Andalucía
- MORENO JIMÉNEZ, A. (2008): Sistemas y Análisis de la Información Geográfica. Manual de autoaprendizaje con Arc-Gis, Madrid, Ra-Ma Editorial, 940 pp.
- CONSELLERIA DE INFRAESTRUCTURAS; TERRITORIO Y M: AMBIENTE (2012): Guía metodológica. Estudio de Paisaje.

Additional

- BOSQUE SENDRA, J. y MORENO JIMÉNEZ, A. (2004): Sistemas de Información Geográfica y localización optima de equipamientos, Madrid, Ra-Ma Editorial, 384 pp.
- Lockwood, M., Worboys, G. L., y Kothari, A. (eds.) (2006). Managing protected areas: a global guide. Earthscan.
- COBO BEJARANO, Héctor (1998): Glosario de Metodología. Ed. Impretec
- COMISIÓN EUROPEA (2001): White Paper. European Transport Policy for 2010: time to decide, Bruselas, 12.09.01, COM(2001) 370 final.
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- GÓMEZ DELGADO, M. Y BARREDO CANO, J.I. (2005): Sistemas de Información Geográfica y evaluación multicriterio en la ordenación del territorio, Madrid, Ra-Ma Editorial, 304 pp.
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- MATA, R. (2006b): Métodos de estudio del paisaje e instrumentos para su gestión. Consideraciones a partir de experiencias de planificación territorial. En MATA, R. y TARROJA, A (ed): El Paisaje y la gestión del territorio. Criterios paisajísticos en la ordenación del territorio y el urbanismo, Diputació de Barcelona, Barcelona, pp. 100-239.
- EUROPARC-España (2008). Planificar para gestionar los espacios naturales protegidos. Fundación Interuniv. Fernando González Bernáldez para los espacios naturales.
- NOGUÉ, J. y SALA, P. (2006): Prototipus de catàleg de paisatge. Bases conceptuals, metodològiques i procedimentals per a elaborar els catàlegs de paisatge de Catalunya. Observatori del Paisatge. Olot i Barcelona.
- ORTEGA, M. Y CERDÀ LL. (2004): Gestió local de la mobilitat sostenible i segura, Barcelona, Fundació Pi i Sunyer dEstudis Autonomics i Locals, 239 pp.
- WASCHER, D. M. (2005): European Landscape Character Areas. Typologies, Cartography and Indicators for the Assessment of Sustainable Landscapes. Final Project Report as deliverable from the EU's Accompanying Measure project European Landscape Character Assessment Initiative (ELCAI), funded under the 5th Framework Programme on Energy, Environment and Sustainable Development. Wageningen: Landscape Europe.
- BALAGUER-PUIG, M.; MARQUÉS-MATEU, A.; LERMA GARCÍA, J.L.; IBAÑEZ ASENSIO, S. (2017) Estimation of small-scale soil erosion in laboratory experiments with Structure from Motion photogrammetry. Geomorphology (295) 285 - 296
- ELTNER, A. (2016): Photogrammetric techniques for across-scale soil erosion assessment. Developing methods to integrate multi-temporal high resolution topography data at field plots. PhD. 157p.
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- GHISLANZONI, M. (Ed.) (2014): Guía de integración paisajística de parques eólicos en Andalucía. Sevilla, Consejería de Medio Ambiente y Ordenación del Territorio.