COURSE DATA

DATA SUBJECT

Code: 41056
Name: Modelling techniques and geographical information systems
Cycle: Master's Degree
ECTS Credits: 10
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
2001 - Master's Degree in Environmental and Territorial Management Techniques	Facultat de Geografia i Història	1	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2001 - Master's Degree in Environmental and Territorial Management Techniques	Methods and techniques applied to land use planning	ELECTIVES

COORDINATION

ZORNOZA GALLEGO CARMEN

SUMMARY

The main objective of this subject is that the student learns to elaborate studies and analyses applied to different specific objectives of territorial planning using geographic information systems as a tool for information management, representation and spatial modelling.

The first part of the course begins by introducing different data visualisation techniques, with the aim of being able to produce effective visualisations of information that help to communicate efficiently. These techniques will be combined with the creation of interactive and online cartography, acquiring skills to effectively share different networked projects. This first part focuses on enhancing cartographic communication strategies.

The second part of the course begins with the design and management of relational files and databases, which allow the handling of large amounts of geographic data. Subsequently, GIS are used as a spatial modelling tool to prepare studies and analyses applied to different objectives: studies of the reception capacity of a territory, projects for the location of facilities and infrastructures, analysis of markets and establishments aimed at making location and management proposals in a business environment.

In addition, spatial statistical analysis using GIS is introduced, addressing both basic indicators and

advanced tools for the detection of spatial patterns and clusters, such as Moran's I, Getis-Ord, Ripley K, or spatial cluster analysis.

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

COMPETENCES / LEARNING OUTCOMES

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Capacidad de organización, planificación y gestión de la información ambiental y territorial

Capacidad de realizar la planificación territorial: análisis, diagnóstico y propuestas.

Manejo de Sistemas de Información Geográfica aplicados a los problemas medioambientales y territoriales

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.

Técnicas de análisis cuantitativo

DESCRIPTION OF CONTENTS

1. Techniques for data visualisation and interactive mapping

Introduction to data visualisation.
Types of data.
Production of interactive maps.

2. 'On line' cartography

Dissemination of cartography via the Internet.
Improvement of cartographic communication models.

3. Fundamental concepts of relational databases and geodatabases

Databases. Basic concepts.
The entity-relationship model.
Database design.
Geodatabases: concept and development in ArcCatalog.

4. Analysis of environmental factors with raster and vector GIS

Operations for the analysis of environmental factors.
Generation of models.
Geostatistical techniques.
Modelling using non-parametric estimation techniques.
Kernel type estimation.
Landscape analysis techniques using extended neighbourhood operations on raster models.
Analysis of the carrying capacity of the territory.

5. Location of facilities and infrastructures

Models for the location of facilities and services.
Public facilities and services.
Determination of areas of influence and market potential of private establishments.
Models for the location of private services.
A professional application: geomarketing.

6. Statistical analysis with GIS

Basic indicators of spatial statistics.

Spatial pattern detection: Average Nearest Neighbour, General G Getis-Ord, Ripley's Function K, Moran's I global.
Cluster Detection: Anselin local Morans I, Getis-Ord Hot Spot Analysis or GI *.
Grouping Analysis.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	2,00
Computer classroom practice	60,00
Total hours	**62,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	90,00
Preparation of lessons	0,00
Preparation for assessment activities	70,00
Resolution of case studies	28,00
Total hours	**188,00**

TEACHING METHODOLOGY

All classes take place in the computer room, and have a theoretical and practical focus. Theoretical content and the use of IT tools will be explained.

Classes will be supplemented by individual work aimed at performing simplified applications with real data and with the results shown as reports. To prepare this work, outside of class time students have access to a fully equipped classroom, as well as a virtual classroom.

Seminars: designed to show practical experience and present and discuss student work.

EVALUATION

The evaluation model is:

- Attendance at seminars (minimum requirement of 80 % attendance).

- Examination: 25 %.

- Guided work: 70 %.

- Complementary activities: 5 %.

Regarding the assessment and grading, the appropriate provisions of Chapter VI of the Regulations of assessment and grading of the Universitat de València for bachelor's and master's degrees will be followed. ACGUV 108/2017 (http://www.uv.es/graus/normatives/2017_108_Reglament_avaluacio_qualificacio.pdf).

Regarding the plagiarism of any of the works requested in the framework of this module, the CEC approves, in the meeting of 26 March 2024, that the deliveries with 20% or more of plagiarism will be automatically suspended.

We also recommend accessing and reading the Protocol of action against fraudulent practices at the Universitat de València. ACGUV 123/2020 (https://www.uv.es/sgeneral/Protocols/C83sp.pdf).

REFERENCES

Basic:

Bosque, J., y Moreno, A. (2004). *Sistemas de Información Geográfica y localización de instalaciones y equipamientos*. Ra-Ma.

Campbell, J. E., y Shin, M. (2011). *Essentials of geographic information systems*. https://www. saylor. org/books/.

Gómez, M., y Barredo, J. I. (2005). *Sistemas de información geográfica y evaluación multicriterio en la ordenación del territorio*. Ra-Ma.

Moreno, A. (2005). *Sistemas y Análisis de la Información Geográfica. Manual de autoaprendizaje con ArcGis*. Ra-Ma.

Wise, S. (2018). *GIS fundamentals*. CRC Press.

Wright, D. J., Harder, C., y Diamond, J. M. (2019). *GIS for science: Applying mapping and spatial analytics*.

Complementary:

ADSUARA, X. (2000). Criterios generales para la integración del planeamiento urbanístico y territorial en un Sistema de Información Territorial (SIT), *Ciudad y Territorio. Estudios Territoriales*, 124, 183-208.

AGUIRRE, G. (2005). La valoración de los riesgos en la ordenación del territorio: Metodología práctica, *Boletín de la AGE*, 40, 393-405.

AMAGO, F. S. (2000). *Logística y marketing geográfico. Geomarketing para tomar decisiones visualmente*. Logis Book.

BOSQUE, J., y GARCÍA, R.C. (2000). El uso de los sistemas de información geográfica en la planificación territorial. *Anales de Geografía de la Universidad Complutense*, 20, 49-67.

CHASCO, C. (2003). El Geomarketing y la distribución comercial. *Investigación y Marketing*, 79, 6-14.

DEL POZO, F., BOSQUE, J., GÓMEZ, M., y MORENO, A. (2000). Hacia un sistema de ayuda la decisión espacial para la localización de equipamientos. *Estudios Geográficos*, 61(241), 567-598.

GUTIÉRREZ, J., GARCÍA, J. C., ALVENTOSA, C., REDONDO, J. C., y PANIAGUA, E. (2002). Accesibilidad peatonal a la red sanitaria de asistencia primaria en Madrid, *Anales de Geografía de la Universidad Complutense*, Vol. Extraordinario, 269-280.

LLOYD, C. D. (2010). *Spatial Data Analysis. An Introduction for Gis Users*, Oxford University Press.

MORENO, A. (2001). *Geomarketing con sistemas de información geográfica*. Universidad Autónoma de Madrid.

MORENO, A. (2004). Delimitación y predicción del área de mercado para establecimientos de servicios a los consumidores con sistemas de información geográfica, *Estudios Geográficos*, 63(247), 279-302.

MORENO, A., y PRIETO, M. E. (2004). ¿Cómo afecta la unidad espacial a la visualización y modelado del área de mercado con sistemas de información geográfica?: Implicaciones para el geomarketing. *Estudios Geográficos*, 65(257), 617-636.

TUDELA, M. L., y MOLINA, J. (2005). Estudio de viabilidad ambiental para la localización de parques eólicos en un municipio de la región de Murcia. *Papeles de Geografía*, 41-42, 225-236.