

Geographical Information Systems

Code: 43060
ECTS Credits: 6

Degree	Type	Year	Semester
4313784 Interdisciplinary Studies in Environmental, Economic and Social Sustainability	OT	0	1

Contact

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Use of languages

Principal working language: english (eng)

Prerequisites

No prior knowledge is required.

Objectives and Contextualisation

The main aim of this introductory course is to present the basic concepts and spatial analysis tools provided by the Geographic Information Systems (GIS) derived from the needs in socio-environmental planning and management.

Our general goal is that each student develops skills to interpret and use digital spatial data and set the grounds for further (self-) training in GIScience. The specific objectives are:

- Know how to georeference cartographic data for incorporation into a GIS and to identify the criteria of acceptable quality in this process. This goal will be achieved in several cases applied cases (different map projections, scales, etc.).
- A starting knowledge of data sources and formats useful for geographical studies of all kinds, given special attention to the available standards. The theoretical discussion will be dressed with a series of examples both from the conceptual (uneven geographical distribution of data points, zonal data, etc. in various sizes and backgrounds, with special attention provided through the Internet) and thematic (demographics, weather, etc.) point of view. In this context, expanded knowledge about the meaning, interest and use of metadata standards on spatial data infrastructures and on remote sensing is also covered.
- Practice of digitizing and vector topological structure as a basic source of incorporating data into a GIS. This goal will be achieved in many cases applied (different map projections, scales, etc.) and complete reworking of the classic materials in operations such as grouping criteria for thematic parks, etc.
- Introduce the knowledge of basic GIS operations such as mosaic, clipping, changes in spatial resolution and map projection and reference systems (ED50 to ETRS89, for example), raster /vector conversion, etc.
- Present and extend the GIS analysis tools knowledge in the context of real-world applications shown on this course, including spatial dynamics with remote sensing, both urban growths as forest fires, etc.

Skills

- Analyse how the Earth functions on a global scale in order to understand and interpret environmental changes on the global and local scales.
- Apply specific methodologies, techniques and resources to conduct research and produce innovative results in the area of Environmental Studies.

- Continue the learning process, to a large extent autonomously.
- Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
- Work in an international, multidisciplinary context.

Learning outcomes

1. Apply spatial analysis results to particular environmental planning and risk evaluation cases.
2. Apply specific methodologies, techniques and resources to conduct research and produce innovative results in the area of Environmental Studies.
3. Continue the learning process, to a large extent autonomously.
4. Evaluate the processes of transformation of the territory and the population by applying methodologies and instruments associated with reference theories, which can measure intervention mechanisms and results.
5. Show mastery of cartographic expression of territorial information.
6. Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
7. Use Geographical Information Systems (GIS) both conceptually and when applied to problem solving in environmental and regional planning.
8. Work in an international, multidisciplinary context.

Content

The diverse lessons to develop in the course are:

- Lesson 1: Geographic information
- Lesson 1a: Data types and formats
- Lesson 2: Georeferencing
- Lesson 3: Value of geographic information
- Lesson 4: GIS data models
- Lesson 4b: Remote sensing and GIS
- Lesson 5: Use of GIS: analysis
- Lesson 6: Use case applications

The application of the concepts and tools covered by the course in use case exercises will be developed throughout the course, in an integrated manner. Moreover, the sessions order may vary from the content list for practical reasons.

course.

Methodology

The course content will be developed through the following activities:

- Oral expositions from the teacher
- Reading book chapters or articles (individual activity of students, complementary to classroom work)
- Practical classes guided by the teacher
- Work done independently by students based on teacher proposals
- Oral expositions from the students

For the realization of the course some different GIS software will be used.

Activities

Title	Hours	ECTS	Learning outcomes
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Type: Directed

1. Lectures	18	0.72
2. Practical exercises guided by the teacher	24	0.96

Type: Supervised

1. Resolution guided practice	25	1
2. Monitoring oral presentation	15	0.6

Type: Autonomous

1. Reading theoretical literature	15	0.6
2. Practical exercises independently developed by students	28	1.12
3. Final project development	15	0.6

Evaluation

The course evaluation will be obtained from practical exercises made in the classroom and at home (30% of final qualification), a brief oral presentation (30%) and a short final exam (40%).

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
1. Final exam	40%	2	0.08	4, 5
2. Oral presentation	30%	3	0.12	5, 6, 7
3. Practical exercises	30%	5	0.2	1, 2, 3, 8

Bibliography

- Bonham-Carter, G.F. (1994) **Geographic information systems for geoscientists modelling with GIS**, Pergamon. Kidlington. 398 p.
- Burrough, P.A., McDonnel, R.A. (1998) **Principles of Geographical Information Systems (2nd Edition)**. Oxford University Press.
- Malczewski, J. (1999) **GIS and Multicriteria Decision Analysis**. John Wiley & Sons. Inc., New York, 392 p.
- Laurini, R., Tompson, D. (1992) **Fundamentals of Spatial Information Systems** Academic Press. Londres. 680 p.
- Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W. (2005), **Geographical Information Systems and Science**. Wiley.
- Maguire, D.J., M.F. Goodchild, Rhind, D.W. (eds.) (1991) **Geographical Information Systems. Principles and Applications**. 2 Vol. Longman Scienti Technical. Essex. 649+447 p.
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