

**Geographical Information Systems and Image
Processing**

Code: 101031
ECTS Credits: 4

Degree	Type	Year	Semester
2500254 Geology	OB	2	1

Contact

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Use of Languages

Principal working language: spanish (spa)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: No

Teachers

Félix Sacristán Solano

Prerequisites

Students will have to use their own external storage system (pen drive, external hard drive, ...) to manage all the information and data used throughout the course.

Objectives and Contextualisation

Within the concept of Information Technology, Geographic Information Systems (GIS) are a set of tools of great interest for its versatility and multidisciplinary.

The application of GIS in areas as diverse as sustainable use, prevention of natural risks, tracking and simulation of dynamic processes (changes in land uses, water management ...) make the GIS basic tools in numerous scientific disciplines and in the field of research.

GIS also represents a powerful spatial-temporal information management tool for all fields related to Geology and the Environment.

The overall purpose is that students integrate the theoretical and practical aspects of these technologies and be able to apply these skills to the management and resolution of problems.

Competences

- Learn and apply the knowledge acquired, and use it to solve problems.
- Suitably transmit information, verbally, graphically and in writing, using modern information and communication technologies.
- Use geographical information systems applied to geology.
- Work independently.

Learning Outcomes

1. Learn and apply the knowledge acquired, and use it to solve problems.
2. Manage georeferenced information using suitable GIS computer programmes.
3. Master the different ways of acquiring and managing geographical information as a tool for territorial interpretation, especially maps and images of the Earth.
4. Suitably transmit information, verbally, graphically and in writing, using modern information and communication technologies.
5. Work independently.

Content

Block 1. Introduction to geographic information systems

Basic concepts of cartographic applications, geographic data models: raster data

The work dimensions of the GIS. Graphic representation of geographic information: 2D display, 3D raster

Topographic maps for geological cartography and georephenation of the geological map

Block 2. Generation, structuring and dissemination of information in digital format

Basic concepts of cartographic applications, Geographic data models: Raster data, vector data, TIN data

Creation of geological map of GEODataBases

Graphic representation of elaborated geographic information and creation of reports (composition of maps - Layout)

Block 3. Analysis of information

map algebra Overlay, proximity and zoning operations. Spacious medications on objects. Raster vector conversion. Queries in the database. Understand and use the different display options of each layer. Calculation of statistical values.

Creation and analysis of Digital Land Models: Interpolation Techniques, Analysis of topography, flow extraction. Calculation of zonal and focal statistical values.

Methodology

Master classes with computer support

Through the attendance to the classes the students will assume the own knowledge of the subject. At all times, work will be done in the computer to consolidate the use of specific software and analysis techniques.

Laboratory practices

The hours of practice are designed to learn GIS programs (ArcMap and Qgis)) using data in geology and solving practical problems.

The group of students enrolled will be distributed in groups with respect to their name.

In the event that the classes have to be carried out electronically, it is planned to program remotely, with the aim that each student can work with a computer individually

Autonomous work:

Study of topics and carrying out exercises using the specific programs.

Evaluation of the asignatura:

the teacher will have to allocate approximately 15 minutes of some class to allow that his students can answer the surveys of evaluation of the educational performance and of evaluation of the asignatura or module.

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			
Computer lab practices	40	1.6	1, 2
Master classes with information technology support	40	1.6	1, 3, 2
Type: Autonomous			
Practicing using specific software and recommended bibliography	16	0.64	1, 4

Assessment

It is planned (in the absence of validation by a teacher who takes charge of the subject) to carry out two tests, eliminations of matter, weighted each one with the (50%) of the final mark.

The two may be recovered on the date of the final exam established by the Faculty.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Theoretical and practical exams	100%	4	0.16	1, 3, 2, 4, 5

Bibliography

Longley, P.A., Goodchild, M.F. Maguire, D.J., Rhind, D.W. (2001), **Geographical Information Systems and Science**. Wiley. 454 p.

Bibliografía adicional

Bonham-Carter, G.F. (1994) **Geographic information systems for geoscientists modelling with GIS**, Pergamon. Kidlington. 398 p.

Burroughs, P.A., McDonnell, R.A. (1998), **Principles of Geographical Information Systems** (2nd Edition). Oxford University Press. Oxford. 333 p.

Chuvieco, E. (2002), **Teledetección ambiental**. Ariel. Barcelona. 586 p

Gutiérrez Puebla, J., Gould, M. (1994). **SIG: sistemas de información geográfica**. Editorial Síntesis, Madrid.

Laurini, R., Tompson, D. (1992) **Fundamentals of Spatial Information Systems**. Academic Press. Londres. 680 p.

Maguire, D.J., Goodchild, M.F., Rhind, D.W. (eds.) (1991) Geographical Information Systems. Principles and Applications. 2 Vol. Longman Scienti Technical. Essex. 1096 p.

Moldes Teo, F.J. (1995). ***Tecnología de los sistemas de información geográfica***. Ra-Ma, Madrid. 190 p.

Nogueras-Iso, J., Zarazaga-Soria, F.J., Muro-Medrano, P.R. (2005) ***Geographic Information Metadata for SpatialData Infrastructures: Resources, Interoperability and Information Retrieval***. Springer. 264 p.

Santos Preciado Santos Preciado, J.M. (2004) ***Sistemas de información geográfica. Unidad didáctica***. (60105UD01A01) UNED. Madrid. 460 p. ISBN: 84-362-2006-4.

Software

we will work throughout the course with ArcGIS and Qgis