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Faculty of Experimental Sciences

GENERAL SPECIFICATIONS

ACADEMIC YEAR 2023-24

DEGREE IN ENVIRONMENTAL SCIENCES, DEGREE IN GEOLOGY, DOUBLE DEGREE IN ENVIRONMENTAL SCIENCES & GEOLOGY

Subject Data

Name:	
SISTEMAS DE INFORMACIÓN GEOGRÁFICA	
English name:	
GEOGRAPHIC INFORMATION SYSTEMS	
Code:	**Type:**
757709202, 757914108, 757609109	BASIC

Hours:

	Total	**In class**	**Out class**
Time distribution	150	60	90

ECTS:

Standard group	**Small groups**			
	Classroom	**Lab**	**Practices**	**Computer classroom**
6	0	0	0	6

Departments:	**Knowledge areas:**
History, Geography and Anthropology	Physical Geography
Year:	**Semester**
1º	Second semester

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TEACHING STAFF		
Name:	**E-mail:**	**Telephone**
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Others Data (Tutoring, schedule...)		
Tutoring hours in Pavilion 12, ground floor, right. First term: Mondays and Wednesday 11-14 h: Second term: Tuesday and Wednesday 11-14 h Área de Geografía Física Departamento de Historia, Geografía y Antropología Universidad de Huelva Avda. Tres de Marzo, S/N 21071 Huelva		

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SPECIFIC INFORMATION OF THE COURSE

1. Contents description:

1.1 In English:

The Geographic Information Systems (GIS) form a set of methods, procedures and tools that fully manage spatial information. They are intended for solving problems of spatial planning and management of the environment, but also for research, especially in the field of Earth Sciences. The Science of Geographic Information (GISci) is the academic theory that is behind the use and development of GIS technology. In this subject we will approach in a computer environment the fundamentals of GIS with the management of information from various sources (IGN, IECA, IGME, etc.), especially from geoportals and Spatial Data Infrastructures (SDI), learning methods and spatial analysis tools (vector and raster) and procedures for the design and preparation for thematic cartography. This compulsory subject of the first course is developed completely with teaching practice in computer labs.

1.2 In Spanish:

Los Sistemas de Información Geográfica (GIS) forman un conjunto de métodos, procedimientos y herramientas que manejan de manera completa información espacial. Están destinados a la resolución de problemas de planificación y gestión del territorio y del medioambiente, pero también a la investigación, especialmente en el ámbito de las Ciencias de la Tierra. La Ciencia de la Información Geográfica (GISci) es la teoría académica que está detrás del uso y desarrollo de la tecnología GIS. En esta aGISnatura abordaremos en entorno informático los fundamentos de los GIS con el manejo de información de diversas fuentes (IGN, IECA, IGME, etc.), especialmente a partir de geoportales e Infraestructuras de Datos Espaciales (IDE), el aprendizaje de métodos y herramientas de análisis espacial (vectorial y ráster) y de procedimientos para el diseño y elaboración de cartografía temática. Esta materia obligatoria de primer curso se desarrolla de forma completa con docencia práctica en aulas de informática.

2. Background:

2.1 Situation within the Degree:

It is intended that the future graduate acquires the basic knowledge to analyse and relate the different sources of geographic information, as well as to approach the level of GIS consultant and to steer the system, by applying spatial analysis tools, towards their ultimate goal: to develop analytical products for the resolution of spatial problems. These are objectives that you will find regularly in the development of your professional practice in the field of Earth Sciences, Environment and Territory, both in the public and private sectors.

2.2 Recommendations

This subject is composed only of computer groups (maximum 27 people), and therefore will only be developed in the computer classrooms of the Pérez Quintero Building of the Campus of El Carmen. Al It is important to have a storage device (pendrive type) for exclusive use in GIS of at least 8 Gb.

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3. Objectives (as result of teaching):

Specific objectives (developed from the general objective)
Cognitive: Approach GIS as a discipline, and know, understand, analyse, and relate the different sources of Geographic Information (Cartography, Remote Sensing, Geodatabases).Know and understand the main software available for the management of geographic information.
Procedural/instrumental: Create and manage a GIS approaching the user/consultant level, as well as develop and apply spatial analysis tools. Develop a GIS project to solve complex territorial and environmental problems, creating final analytical products and representations of results through graphic and cartographic techniques.
Attitudinal: Development of a global vision of work and an organized, methodical, analytical, and critical attitude towards it.

4. Skills to be acquired

4.1 Specific Skills:

E18 - Ability to use computer tools and statistics applied to the environment.

4.2 General, Basic or Transversal Skills:

CB1 - Those students have proven to possess and understand knowledge in an area of study that is based on general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that involve knowledge coming from the forefront of his field of study.
CB2 - Those students know how to apply their knowledge to their work or vocation in a professional way and possess the competencies that are usually demonstrated through the elaboration and defence of arguments and the resolution of problems within their area of study.
CB3 - Those students can collect and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific, or ethical issues.
CB4 Those students can transmit information, ideas, problems, and solutions to both a specialized and non-specialized audience.
CB5 - Those students have developed the learning skills necessary to undertake further studies with a high degree of autonomy.

G1 - Analysis and synthesis capacity.
G2 - Organizational and planning capacity.
G5 - Computer skills related to the field of study.
G6 - Information management capacity.
G7 - Problem solving.
G8 - Decision making.
G12 - Autonomous learning.
G14 - Critical reasoning.
G18 - Sensitivity to environmental issues.
G19 - Ability to apply theoretical knowledge in practice.
G20 - Use of the internet as a means of communication and as a source of information.
G23 - Capacity for self-assessment.

CT1 - Those students have developed and demonstrated learning skills and knowledge from their field of study, being able to apply them in their work, interpreting relevant data to make judgments on issues of various kinds and transmitting them to both specialized and non-specialist audiences.

5. Training Activities and Teaching Methods

5.1 Training Activities:

Classes will be developed in computer classrooms using ArcGIS software. The activities will be adapted to each theme addressed, from the design of thematic maps to the use of geoprocessing tools and the resolution of spatial analysis problems.

5.2 Teaching Methods:

- Theoretical Academic Sessions.
- Practical Academic Sessions.
- Seminars / Exhibition and Debate.
- Other autonomous work (Individual Work).

5.3 Development and Justification:

To make a first approach to Geographic Information Systems (GIS) will allow the students to have one of the basic tools for the knowledge, analysis, and management of the territory, of the natural resources, location analysis of human activities, monitoring and simulation of environmental impacts or risk prevention. They will also be able to approach the overall concept of this discipline and the development of GIS projects.

6. Detailed Contents

Block I. The geographical information (24 hours)

The Science of the Geographical Information (GIScience). Conceptualization and functionality of a GIS. Problems that a GIS can solve. The project GIS and its typical phases. The first contact with ArcGIS: potential, modules (ArcMap and ArcCatalog), tools (ArcToolbox) and extensions. The nature of the geographical information. The components spatial and thematic. The structure of the information in caps. The models of information raster and vectorial. The topology. The models of representation of elevations(increases) (MDT). The visualization of the geographical and alphanumeric information and management of information in ArcCatalog and ArcMap. Sources of geographical and territorial information. The direct and derivative images. The summary of the information: spatial Databases of reference, the DERA (IECA). The Network(Net) of environmental information of Andalusia (REDIAM). The CORINE Land Cover (CLC), the MUCVA and the SIOSE. The geoinformation in Internet: visors and geoportals, infrastructures of spatial information (IDE); services OGC. The cartography like basic source of geographical information and instrument of territorial analysis. The cartographic design: language and elements of the map. Qualitative and quantitative symbolization. The design of maps in ArcMap. Capture and integration of the geographical information. Digital formats (images, shapefiles and geodatabases). Systems of spatial reference. Methods of georeferencing. Digitalization and edition of geo-data.

Block II. The analysis, alphanumeric and spatial of the geographical information. Main operations of vectorial calculation and raster (24 hours)

Alphanumeric analysis. The storage of the thematic information and the relational model of information. The selective search of information: the consultations SQL and the selections for spatial location. Union and relation of information, thematic and for location. Creation and managing of thematic databases from ArcCatalog and ArcMap. Spatial Vectorial analysis. Local operations. Geographical selection, extraction and overlapping. The spatial and thematic reclassification of the information.

The tools of geoprocessing in ArcMap: personal details (Merge and Dissolve), extraction (Clip and Select) and of Overlay or overlapping (Union and Intersect). Operations of proximity: Generation and analysis of areas of influence or Buffers. Spatial analysis Raster. Digital Elevation Models (DEM): Calculation of orientations, slopes, and digital shading. Algebra and raster reclassification.

Block III. Applications of the Information systems Geographical (12 hours)

Applications of the environment and of the geo-resources: changes in the uses of the soil, management of natural resources, analysis of the landscape, capacity and environmental impact, natural risks. Accomplishment of analysis in the dynamics temporary space of the uses of the soil and accomplishment of maps of aptitude of the territory in Europe, Spain, and Andalusia. Applications in the territorial planning.

7. Bibliography

7.1 Basic Bibliography:

- CHUVIECO, E. (2010): Teledetección ambiental. Barcelona: Ariel
- MORENO JIMÉNEZ, A. (Coord.) (2005): Sistemas y Análisis de la Información Geográfica. Madrid: RaMa.
- OLAYA, V. (2013): Sistemas de Información Geográfica. http://volaya.github.io/libro-GIS/
- ROBINSON, A. H. et alia (1995): Elements of Cartography. New York: Wiley.
- SANTOS PRECIADO, J.M. (2004): Sistemas de Información Geográfica. Madrid: UNED

7.2 Additional Bibliography:

- BOSQUE, J. (1997): Sistemas de Información Geográfica. Rialp, Madrid.

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- HARLEY, J.B. (2005): La nueva naturaleza de los mapas. Ensayos sobre la historia de la cartografía. Fondo de Cultura Económica. México
- JOLY, F. (1988): La cartografía. Ariel, Barcelona. MITCHELL, A. (2005): The ESRI Guide to GIS Analysis, Vol. 2: Spatial measurements and statistics. Redlands (CA)-USA. OJEDA ZÚJAR, J. (2000): "Andalucía: el conocimiento del territorio andaluz"; en *Mapping*, nº 59. pp. 40-42.
- SANTOS PRECIADO, J.M. (2002): El tratamiento informático de la información geográfica. UNED. Madrid.
- SANTOS PRECIADO, J.M. Y COCERO MATESANZ, D. (2006): Los GIS raster en el campo medioambiental y territorial. Ejercicios prácticos con MiraMon e Idrisi. Cuaderno de Prácticas, UNED. Madrid.

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http://www.juntadeandalucia.es/medioambiente/site/rediam
http://www.juntadeandalucia.es/institutodeestadisticaycartografia

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8. Systems and Assessment Criteria

8.1 System for Assessment:

- Audiovisual presentations.
- Case study.
- Solving exercises and problems.
- Implementation of projects.
- Autonomous learning.
- Cooperative learning.
- Personalized attention to students.

8.2 Assessment Criteria and Marks:

8.2.1 Examinations Convocatory I

The course has a continuous assessment based on attendance and active participation in class. Repeated absence from class (more than 6 classes) is considered incompatible with continuous assessment and will be graded as a No Present.

This continuous assessment consists of three main blocks.

The first of these consists of two practical tests that will be developed during the course in class hours (to be carried out using the corresponding GIS software), which will correspond to Blocks I and II of the syllabus. The practical nature of the subject and the continuous assessment method used prevent these two tests from being considered as partial assessments in which material is eliminated. Some aspects will only be assessed in one of the two tests, but much of the content will inevitably be taken into account in both. Each of these tests will be assessed with 30% of the course (**60%** in total). The average of the marks obtained in both will be obtained, regardless of the mark obtained in each of them. This part will be passed with 5/10 points, but the minimum mark for averaging with the rest of the continuous assessment is 4/10 points. If these practical tests are passed, but the class activities are not presented, or the Final Report is not presented or is failed, the grade can be reserved until the ordinary exam II, if the student so wishes. Given that the Faculty of Experimental Sciences reserves the date and classroom by default for the final assessment in June, the teaching staff may use this calendar for the second assessment test.

Secondly, students will complete the activities developed during the classes and, in some cases, they will complete some maps or similar at home as individual work. The result of each exercise must be uploaded to Moodle in the week following its completion in class, following the scheme established for this purpose. All class exercises must be handed in. The teachers will select a part of the material produced which will be graded and will represent **20%** of the final grade of the course.

Thirdly, there is the preparation of a Final Report which will consist of the resolution of a practical case study adapted to the GIS project type, valued at **20%** of the overall grade for the course. The procedure is provided with a detailed outline of the steps to follow, which will be carried out in class. Students will have to elaborate a report that will include a map of the results obtained and a document with the justification of procedures, methodologies and tools used. The contribution of a further step in the analysis of this case will be valued in order to refine the conclusions. This work corresponds to Block III, considered as a compendium of the methods and techniques learned, and is compulsory, and must obtain at least a grade of 3/10 as a requirement to pass the subject. The grade for the Final Report may be kept until the ordinary exam II, if the student so wishes.

The absence of any of the three evaluation blocks will lead to a grade of Not Presented.

8.2.2 Examinations Convocatory II

It will also consist of three parts to be handed in on the examination date established by the Faculty of Experimental Sciences:

A practical test to be carried out using the corresponding GIS software which will consist of exercises that may refer to Blocks I and II. This test will constitute **60%** of the final grade. The minimum mark for averaging with the rest of the sections of the final assessment is 4/10 points.

The delivery of a set of materials produced by the student during the study of the subject (maps, graphs, databases and any other), valued with **20%** of the final grade.

The delivery of a Final Report that will constitute a practical case study adapted to a GIS project type, valued at **20%** of the final grade. Through the moodle platform, students will be provided with a detailed outline of the steps to be followed. Students will have to prepare a brief report that will include a map of the results obtained and a document with the justification of procedures, methodologies and tools used. The contribution of a further step in the analysis of this case will be valued in order to refine the conclusions. This work corresponds to Block III, considered as a compendium of the methods and techniques learned, and is compulsory, and must obtain at least a grade of 3/10 points as a requirement to pass the subject.

Failure to complete any of the three evaluation blocks will result in a grade of Not Presented.

Students who need to use this type of assessment are encouraged to attend tutorials regularly.

8.2.3 Examinations Convocatory III

Same as in Convocatory II.

8.2.4 Extraordinary Convocatory

Same as in Convocatory II.

8.3 Single Final Evaluation:

The general or final evaluation process will be carried out in the official call for students who request it through the procedure established by the University of Huelva at the beginning of the four-month period. It will also consist of three parts to be handed in on the exam date established by the Faculty of Experimental Sciences:

A practical test to be carried out using the corresponding GIS software which will consist of exercises that may refer to Blocks I and II. This test will constitute **60%** of the final grade. The minimum mark for averaging with the rest of the sections of the final assessment is 4/10 points. If this practical test is passed, but the materials produced by the student are not presented or the Final Report is not handed in or is failed, the grade may be reserved until the ordinary exam II, if the student so wishes.

The delivery of a set of materials produced by the student during the study of the subject (maps, graphs, databases and any other), valued with **20%** of the final grade.

The delivery of a Final Report that will constitute an adapted practical case study of GIS project type, valued with **20%** of the final grade. Through the moodle platform, students will be provided with a detailed outline of the steps to be followed. Students will have to prepare a brief report that will include a map of the results obtained and a document with the justification of procedures, methodologies and tools used. The contribution of a further step in the analysis of this case will be valued in order to refine the conclusions. This work corresponds to Block III, considered as a compendium of the methods and techniques learned, and is compulsory, and must obtain at least a grade of 3/10 points as a requirement to pass the subject. The grade for the Final Report can be kept for the ordinary exam II, if the student so wishes.

Absence from any of the three evaluation blocks will lead to a grade of Not Presented.

Students who need to use this type of assessment are urged to attend tutorials regularly.

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9. Indicative weekly teaching organization:				
Date	**Large groups**	**Small groups**	**Evaluable tests and/or activities**	**Content**
		Computer class		
01-02-2023	0	4		
06-02-2023	0	4		
13-02-2023	0	4		
20-02-2023	0	4		
27-02-2023	0	4		
06-03-2023	0	4		
13-03-2023	0	4		
20-03-2023	0	4		
27-03-2023	0	4		
10-04-2023	0	4		
17-04-2023	0	4		
24-04-2023	0	4		
01-05-2023	0	4		
08-05-2023	0	4		
15-05-2023	0	4		
Total	0	60		