Universitat Autònoma de Barcelona

**2020/2021**

# Geographical Information Systems

Code: 100735
ECTS Credits: 6

| Degree | Type | Year | Semester |
|---|---|---|---|
| 2500241 Archaeology | OT | 3 | 0 |
| 2500241 Archaeology | OT | 4 | 0 |
| 2501002 Geography and Spatial Planning | OB | 2 | 1 |

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

## Contact

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## Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

## Teachers

Cristina Domingo Marimon

## Prerequisites

Archaeology

Students enrolled in this course should have passed previously the course *Introduction to cartography* from the Archaeology Degree.

Geography and Spatial Planning

Students attending to this course should have passed previously the following courses 1. *Mapping*, 2. *Case Study: Geography Techniques* and 3. *Statistics* from the Geography and Spatial Planning Degree.

## Objectives and Contextualisation

Archaeology

Geographic information systems are a very useful tool for archaeology, either for management and visualization of data collected both in surveys and excavations and for the later tasks of analysis, interpretation and mapping of the results.

According to this goal, the course has three main objectives:

1. To provide the principles for understanding and using geographic information systems (GIS) and database management systems (DBMS).

2. To provide a systematic knowledge of methodologies and analytical capabilities of GIS applied to archaeology, using exemples and case studies specifically archaeological.
3. To provide a broad knowledge of the different types of archaeological applications of GIS, covering survey, excavation, landscape archaeololgy, modelling and prediction of site locations.

Geography and Spatial Planning

The main goal of the course is to provide a solid knowledge of conceptual and methodological principles of GIS. The coourse is a first introduction to the field of geographic informaton and GIS. It does'nt intend to train in using any particular software, but to achieve a good understanding of the nature of geographic information and spatial analysis. At the end of the course, students should be able to apply the knowledge and skills learnt to solve problems and needs arosen from the other courses in the Geography and Spatial Planning Degree.

Particular goals are divided in two groups according to their conceptual or operative nature.

At the conceptual level, particular objectives of the course are:

- Understanding the nature of GIS (definition and characteristics).

- Knowing and understanding the two main data models used to represent the world (vector and raster data models).

- Knowing and understanding the process of editing, structuring and storing geographic information.

- Knowing and understanding the main GIS functions for analysis anda data manipulation.

- Knowing the main data sources of geographic information.

- Knowing the principal applications of GIS.

Main objectives of the course at the operative level are:

- Using GIS as a tool to obtain answers to specific questions.

- Knowing which operations should be used in each case to solve specific problems.

- Acquiring a basic practical expertise in solving spatial problems.

## Competences

Geography and Spatial Planning

- Analysing and interpreting environmental problems.
- Analysing and interpreting landscapes.
- Mastering the different forms of management and acquisition of geographic information as interpretation tools of territory, and maps and Earth observation imagery in particular.
- Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
- Students must develop the necessary learning skills in order to undertake further training with a high degree of autonomy.

## Learning Outcomes

1. Analysing and interpreting environmental problems using geographical information systems.
2. Analysing the main dynamics of today's world from a geographical point of view.
3. Comparing landscapes using geographical information systems.
4. Describing the various methods of geographical information retrieval as production and interpretation tools of maps.
5. Producing an individual work that specifies the work plan and timing of activities.

6. Solving problems autonomously.
7. Summarising acquired knowledge about the origin and transformations experienced in its several fields of study.

## Content

Archaeology

*Part I. Fundamentals of GIS and DBMS* (40%)

1. Geographic information systems applied to archaeology.

2. Geographic information systems software (GIS).

3. Database management systems (DBMS).

4. Spatial data management.

*Part II. Managing and Analyzing spatial data* (60 %)

5. Digital elevation models. Surface interpolation.

6. Exploratory analysis. Visualizationa and querying.

7. Cartographic analysis. Geoprocessing and map algebra.

8. Spatial analysis.

9. Terrain analysis. Geomorphology, hydrology, visibility.

10. Cost surface analysis. Minimal cost distance paths.

Geography and Spatial Planning

*Part 0: Introduction to GIS*

History of GIS.

GIS definition, components and functions.

*Part 1: Geographic information*

Information on the land and information on phenomena located on the land.

Geographic and non-geographic entities.

Nature of geographic information.

The added value of georeferenced information.

*Part 2: Georeferencing*

Location as a means of relating.

Basic methods of georeferencing.

Main spatial reference systems.

*Part 3: Data models used in GIS*

Raster data model.

Vector data model.

Data sources and web geoservices.

*Part 4: Introduction to the use of GIS*

Data querying: queries and selections by attributes and by location.

Basic GIS analysis functions: overlay and proximity analysis.

## Methodology

Archaeology

Theoretical and methodological subjects are introduced with concise lectures and are developed by the autonomous work done by the students, which includes studying specific course materials (class notes provided for all the subjectes) available at UAB Virtual Campus and general readings (bilbiography and web resources).

Technical abilities are acquired by a set of guided exercises done by the students in a computer lab during the teaching period or on their own.

For each subject students will do 1 or 2 exercises at an approximate rate of one exercise per week.

All the course resources (class notes, exercises, quizzes, documents and data) are available online at UAB Virtual Campus (a Moodle based e-learning platform).

The activities that cannot be done in person will be adapted to the possibilities offered by the UAB virtual tools. The exercises, projects and theoretical classes will be carried out through virtual tools, such as tutorials, videos, TEAMS sessions, etc. The teacher will ensure that the student can access or offer alternative means, when available.

Geography and Spatial Planning

The course is developed by the following types of activities:

- Documentation and reading guides provided by the teacher.

- Read a book or an article (individual activity).

- Teacher-guided practices.

- Practices carried out autonomously by the students based on proposals from the teachers.

The course uses specific GIS software such as ArcGIS, MiraMon and QGIS.

The activities that cannot be done in person will be adapted to the possibilities offered by the UAB virtual tools. The exercises, projects and theoretical classes will be carried out through virtual tools, such as tutorials, videos, TEAMS sessions, etc. The teacher will ensure that the student can access or offer alternative means, when available.

## Activities

| Title | Hours | ECTS | Learning Outcomes |
|---|---|---|---|
| Type: Directed | | | |
| Guided exercises, either guided by teachers or using detailed tutorials | 30 | 1.2 | 2, 4, 7 |

| | | | |
|---|---|---|---|
| Lectures with TIC support | 20 | 0.8 | 2, 7 |
| Type: Supervised | | | |
| Exercises carried out by the students outside the classroom, according to a work plan supervised and evaluated by the lecturer | 21 | 0.84 | 4, 6 |
| Type: Autonomous | | | |
| Exercises done by the students according to a work plan. Personal readings | 75 | 3 | 2, 4, 5, 6, 7 |

## Assessment

Archaeology

Evaluation of this course is continuous and is based on the outcome of the practical exercises, either guided or autonomous. All the execises should be submitted in the time scheduled. Assignments not submited in time can be

submited at the end of the semester (several days before the final exam).

All the exercises are mandatory and have to be done individually. The average of all assignment grades is the exercises grade. Exercises can not be retaken nor re-evaluated.

The exercises grade must be validated passing a final exam at the end of the semester (first week of June).

To pass the course students have to:

- ***submit at least 80% of the exercises assigned*** to have the right to attend to the final exam.

- ***pass the final (or recovery) exam with a minimum grade of 5 over 10***.

Once the final (or recovery exam) is passed, the final grade of the course will be the highest grade, either the exercises grade or the exam grade.

RECOVERY: Students that do not pass the final exam will have the right to do a recovery exam two weeks later, in the date scheduled by the school. Requirements for attending to the recovery exam are the same for attending to the final exam (80% of the exercises submitted).

In the event that tests or exams cannot be taken onsite, they will be adapted to an online format made available through the UAB's virtual tools (original weighting will be maintained). Homework, activities and class participation will be carried out through forums, wikis and/or discussion on Teams, etc. Lecturers will ensure that students are able to access these virtual tools, or will offer them feasible alternatives.

UAB regulations regarding plagiarism and other irregularities in the evaluation process:

In the event of a student committing any irregularity that may lead to a significant variation in the grade awarded to an assessment activity, the student will be given a zero for this activity, regardless of any disciplinary process that may take place. In the event of several irregularities in assessment activities of the same subject, the student will be given a zero as the final grade for this subject.

Geography and Spatial Planning

Assessment of the course in the Geography and Spatial Planning Degree is based in the following activities:

- Partial theoretical exams (30%).

- Partial practical exams (30%).

- Practical exercises (40%).

Average between theoretical and practical exams will require a minimum grade of 4 over 10 in any exam. Exams will only be passed with a minimum average grade of 5 over 10.

Exercise submission is mandatory. The minimum number of exercises submitted is all minus one. Non submitted exercises will have a grade of 0 over 10.

Assessment is continuous. Recovery will be possible only for the exams. Students will have right to a recovery exam only if they have followed the continuous evaluation procedure. Maximum recovery grade is only 5 over 10. It is considered to have followed the continuous evaluation procedure if 30% of the activities have been submitted.

Copying at exams implies immediate FAIL without right of recovery. Copying or plagiarims in the exercises will be considered on a case-by-case basis. Direct FAIL without right of recovery will be applied to cases of extreme or repeated offence.

In the event that tests or exams cannot be taken onsite, they will be adapted to an online format made available through the UAB's virtual tools (original weighting will be maintained). Homework, activities and class participation will be carried out through forums, wikis and/or discussion on Teams, etc. Lecturers will ensure that students are able to access thesevirtual tools, or will offer them feasible alternatives.

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## Assessment Activities

| Title | Weighting | Hours | ECTS | Learning Outcomes |
|---|---|---|---|---|
| Partial practical exams | 30% | 2 | 0.08 | 1, 2, 3, 4, 5, 6, 7 |
| Partial theoretical exams | 30% | 2 | 0.08 | 1, 2, 3, 4, 5, 6, 7 |
| Practical exercises | 40% | 0 | 0 | 1, 2, 3, 4, 5, 6, 7 |

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