VNIVERSITAT DE VALÈNCIA

# Course Guide
# 45007 Tecnologías de la información geográfica para estudios ambientales

## COURSE DATA

| Data Subject | |
|---|---|
| **Code** | 45007 |
| **Name** | Tecnologías de la información geográfica para estudios ambientales |
| **Cycle** | Master's degree |
| **ECTS Credits** | 3.0 |
| **Academic year** | 2022 - 2023 |

**Study (s)**

| Degree | Center | Acad. year | Period |
|---|---|---|---|
| 2250 - M.D. in Environmental Engineering | School of Engineering | 2 | First term |

**Subject-matter**

| Degree | Subject-matter | Character |
|---|---|---|
| 2250 - M.D. in Environmental Engineering | 30 - Tecnologías de la información geográfica para estudios ambientales | Optional |

**Coordination**

| Name | Department |
|---|---|
| SECO TORRECILLAS, AURORA | 245 - Chemical Engineering |

## SUMMARY

UPV Professor: Eric Gielen

The course aims to provide training of an applied nature, focused on demonstrating the usefulness of Geographic Information Systems (GIS) in the different fields of action of environmental engineering. The objective is to show the possibilities of GIS as a modeling tool in the analysis and decision-making processes specific to environmental engineering. It is about training future professionals to identify, formulate and solve complex environmental engineering problems applying GIS. The teaching methodology focused on the resolution of real problems has a plus of motivation for the student and allows revealing the final value of the learning results and their practical utility.

The subject is organized in 3 blocks:

- Introduction of concepts on geographic information and existing technologies for its management
- Possibilities of analysis and environmental diagnosis offered by the GIS
- Introduction to multi-criteria evaluation techniques using GIS.

Being instrumental, the subject proposes the following class distribution: 20% theoretical and 80% practical. The practices will be developed in the free software QGIS.

In reference to the Sustainable Development Goals (SDGs), geospatial data is an elementary resource to be able to comply with the SDGs. The various practices proposed, their models and results are directly or indirectly linked to SDGs such as SDG 6 Clean water and sanitation; SDG 11 Sustainable Cities and Communities; SDG 13 Climate Action; SDG 15 Life of terrestrial ecosystems

## PREVIOUS KNOWLEDGE

### Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

### Other requirements

Good computer skills is recommended. No prior knowledge of GIS required

## OUTCOMES

## LEARNING OUTCOMES

1. Understand the concept of Geographic Information Technology: software, data and modeling.

2. Acquire the basic knowledge for the management of a GIS and the design of projects applied to environmental management.

3. Know the existing cartography in the existing Spatial Data Infrastructures.

4. Know the possibilities of remote sensing as a source of environmental information.

5. Acquire knowledge of the GIS tools necessary for the analysis and diagnosis of environmental information.

6. Acquire knowledge necessary for the design of environmental maps.

7. Know how to apply multicriteria assessment techniques in planning problems and geoenvironmental decisions.

8. Be able to apply GIS in air pollution studies.

9. Be able to apply GIS in landscape study.

10. Be able to apply GIS in host capacity assessment processes.

11. Be able to apply GIS in studies of the ideal location of an activity.

## DESCRIPTION OF CONTENTS

### 1. Introduction to Geographic Information Technologies

Topic 1: Access to geographical information in the 21st century. Map libraries, Geographic information viewers (geoportals) and Spatial Data Infrastructures (IDE). Distribution formats.
Topic 2: Geographic Information Systems (GIS) as a tool for analysis, diagnosis and geo-environmental decision making. Spatial functions. Types of software.

### 2. Environmental analysis and diagnosis with GIS

Topic 3: Introduction to environmental analysis and diagnosis with GIS.
Practice 1: GIS in the environmental impact study. Thematic cartography. Reclassification. Calculation of surfaces. Distance analysis. Overlay. Vector pattern handling.
Practice 2: GIS for the study of air pollution. Geostatistics. Spatial interpolation. Spatial correlation. Distribution patterns. Raster model.
Practice 3: GIS and remote sensing for the analysis of environmental changes. Sensors. Image correction. Multispectral image analysis. Spectral signatures. Supervised and unsupervised classification.
Practice 4: GIS for the study of the landscape. Landscape quality. Landscape vulnerability. Observation points. Digital terrain model. Visibility. Visual basins. 3D view.

### 3. Multicriteria evaluation with GIS.

Topic 4: Introduction to EMC with GIS.
Practice 5: GIS for the calculation of the reception capacity. Limiting factors. Capacity and vulnerability variables. Integration units. Evaluation, in the vector model. Fitness model as an aid to decision making in environmental impact studies.
Practice 6: GIS for the ideal location of an activity. Location factors. Integration using the raster calculator. Proposed location of uses.

## WORKLOAD

| ACTIVITY | Hours | % To be attended |
|---|---|---|
| Computer classroom practice | 24,00 | 100 |
| Theory classes | 5,00 | 100 |
| Theoretical and practical classes | 1,00 | 100 |
| Development of group work | 20,00 | 0 |
| Study and independent work | 25,00 | 0 |
| **TOTAL** | **75,00** | |

## TEACHING METHODOLOGY

**Theoretical activities.**

Expository development of the subject with the participation of the student in the resolution of specific questions. Realization of individual evaluation questionnaires.

**Work in the laboratory and/or computer room.**

Learning by carrying out activities developed individually or in small groups and carried out in laboratories and/or computer rooms.

The e-learning platform (Virtual Classroom of the University of Valencia and/or PoliformaT of the Polytechnic University of Valencia) will be used as a communication support with the students. Through it you will have access to the teaching material used in class, as well as the problems and exercises to be solved.

## EVALUATION

The evaluation has 9 acts that are organized into three types of evaluation acts:

- 20% - Test (2 acts) (EX) with theoretical-practical questions composed of an objective multiple choice test (1 act) and an open-response written test (1 act).

- 75% - Evaluation of the practical activities (6 acts) (P) from the elaboration of 6 reports, one for each proposed practice.

- 5% - Observation or Continuous Evaluation (1 act) (EV), based on the participation and degree of involvement of the student in the teaching-learning process, from the selection and subsequent presentation in class of a research article relating with class topics, which each student will be responsible for searching, summarizing and commenting on.

Whoever does not pass the course may recover the following activities: Test (2 acts) (EX) - 20%; Assessment of practical activities (6 acts) - 75%.

The maximum percentage of absences allowed in classroom theory and computer practice classes will be 20% in each of them.

## REFERENCES

### Basic

- QGIS aplicado al urbanismo. Temes Cordovez, Rafael Ramón.
- SIG revolution : ordenación del territorio, urbanismo y paisaje. Temes Cordovez, Rafael Ramón - Moya Fuero, Alfonso