

## 60402 - Analysing Geographical Information: GISs

### Información del Plan Docente

Academic Year	2017/18
Faculty / School	103 - Facultad de Filosofía y Letras
Degree	352 - Master's in Geographical Information Technology for Territorial Development: Geographical Informations Systems and Teledetection
ECTS	12.0
Year	1
Semester	Annual
Subject Type	Compulsory
Module	---

### **1.General information**

#### **1.1.Introduction**

#### **1.2.Recommendations to take this course**

#### **1.3.Context and importance of this course in the degree**

#### **1.4.Activities and key dates**

### **2.Learning goals**

#### **2.1.Learning goals**

#### **2.2.Importance of learning goals**

### **3.Aims of the course and competences**

#### **3.1.Aims of the course**

#### **3.2.Competences**

### **4.Assessment (1st and 2nd call)**

#### **4.1.Assessment tasks (description of tasks, marking system and assessment criteria)**

### **5.Methodology, learning tasks, syllabus and resources**

#### **5.1.Methodological overview**

The learning and teaching methodology developed in this course has a practical nature, being based on the lecturer's explanations. For each of the topics, a set of theoretical and practical principles are presented, which later on are applied by the students. Thus, explanations - lecture format - introduce theoretical concepts which are combined with more participative sessions where practical application to real data and cases is conducted. The application tasks are always guided by the lecturer, who shows all the possibilities and options that can be done with the software. By doing so, the

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student is able to connect and understand each of the steps already presented in the theoretical part.

### 5.2.Learning tasks

The course includes the following learning tasks:

Topic 3.1.- "Spatial analysis basics":

- Lectures and practice sessions: 35 hours
- Study: 25 hours
- Assessment: 1 hour

Topic 3.2.- "Advanced spatial analysis: Digital Elevation Models":

- Lectures and practice sessions: 15 hours
- Study: 25 hours

Topic 3.3.- "Advanced spatial analysis: network analysis":

- Lectures and practice sessions: 9 hours
- Practical activities: 11 hour
- Guided tasks: 4 hours
- Study: 7 hours

Topic 3.4.- "Advanced spatial analysis: interpolation":

- Lectures and practice sessions: 15 hours
- Study: 16 hours
- Assessment: 1 hour

Topic 3.5a.- "Programming languages: Python":

- Lectures and practice sessions: 5 hours
- Practical activities: 15 hours
- Study and preparation of assignments: 44 hours

Topic 3.5b.- "GIS Open Source desktop applications":

- Lectures and practice sessions: 10 hours
- Practical activities: 15 hours
- Study and preparation of assignments: 10 hours

Topic 3.6.- "Parametric and no-parametric models":

- Lectures and practice sessions: 5 hours
- Practical activities: 10 hours
- Study and preparation of assignments: 25 hours

### 5.3.Syllabus

The course will address the following topics:

Topic 3.1. Basic spatial and GIS analysis.

- Spatial analysis with vector data

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- Analysis and modeling with raster data.
- Introduction to multicriteria evaluation techniques using GIS.

### Topic 3.2. Advanced Spatial Analysis: Digital Elevation Model

- DTM and DEM. Types of models.
- Generation of Digital Elevation Models.
- Analysis of error in the DEMs.
- Derived models.

### Topic 3.3. Advanced Spatial Analysis: Network Analysis

- Definition and basic concepts.
- Editing and preparation of a network.
- Types of networks.

### Topic 3.4. Advanced Spatial Analysis: interpolations

- Basic principles and theoretical fundamentals of interpolation.
- Exact and inexact interpolators.
- Local interpolation methods.
- Global interpolation methods: trend surfaces and regression models.
- Mixed methods.
- Cross-validation and validation by reserving an independent sample. Statistical error.

### Topic 3.5a. Programming languages: Python

- History of programming languages.
- Description of the development environment.
- Programming Basics I.
- Programming Basics II.
- Introduction to ArcPy.

### Topic 3.5b. Open source GIS applications.

### Topic 3.6. Programming with R

- Basic principles of statistical modeling with R.
- Using R for working in GIS environment.
- Principles of creating the statistical model.
- Classification of digital satellite image models "Random Forest".
- Risk modeling using "Binary Logistic Regression".
- Automation of statistical and spatial modeling.

## 5.4. Course planning and calendar

The course is divided into 7 main topics and runs from the end of November until March. This course is organized according to a logical sequence, starting once the courses and contents from "60401 Obtaining and organization of geographic information", "1.4 GIS Basics", and "1.2a Software learning: basic ArcGIS management" are taught. In this way, students will acquire the fundamental theoretical and practical knowledge as well as the basic skills required to use the GIS software. The topics will run in order,

The practical part of the topics must be delivered before the completion of their respective written tests. For those students who have not submitted them within the established deadlines, they may do it before the first (June) or second (September) official exam periods.

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For further details concerning the timetable, classroom and other information of the course please refer to the "Facultad de Filosofía y Letras" website (<https://fyl.unizar.es/horario-de-clases#overlay-context=horario-de-clases>)

### 5.5. Bibliography and recommended resources

- Bernhardsen, Tor. Geographic information systems : an introduction / Tor Bernhardsen . 3rd ed. New York : John Wiley & Sons, cop. 2002
- Bosque Sendra, Joaquín. Sistemas de información geográfica / Joaquín Bosque Sendra . - 2a. ed. corr. Madrid : Rialp, 1997
- Bosque Sendra, Joaquín. Sistemas de información geográfica / Joaquín Bosque Sendra . - [1a ed.] Madrid : Rialp, 1992
- SIG y localización óptima de instalaciones y equipamientos / coordinadores, Joaquín Bosque Sendra, Antonio Moreno Jiménez Madrid : Ra-ma, D.L. 2004
- Buzai, Gustavo D.. Análisis socioespacial con sistemas de información geográfica. Tomo 1, Perspectiva científica. Temáticas de base raster / Gustavo d. Buzai y Claudia A. Baxendale Buenos Aires : Lugar, 2011
- Comas, David. Fundamentos de los sistemas de información geográfica / David Comas y Ernest Ruiz Barcelona : Ariel, 1993
- Geographic information system and science / Paul A. Longley [et. al] . - 2nd ed. Chichester : John Wiley & Sons, cop. 2005
- Gómez Delgado, Montserrat. Sistemas de información geográfica y evaluación multicriterio en la ordenación del territorio / Montserrat Gómez Delgado, José Ignacio Barredo Cano . - 2ª ed. actualizada Madrid : Ra-ma, 2005
- Gutiérrez Puebla, Javier. SIG : Sistemas de Información Geográfica / Javier Gutiérrez Puebla, Michael Gould . 1a. reimp Madrid : Síntesis, 2000
- Gutiérrez Puebla, Javier. SIG : Sistemas de Información Geográfica / Javier Gutiérrez Puebla, Michael Gould . Madrid : Síntesis, D.L. 1994
- Geographic information system and science / Paul A. Longley [et. al] . 2nd ed. Chichester : John Wiley & Sons, cop. 2005
- Mitchell, Andy. The ESRI guide to GIS analysis. V. 1. Geographic patterns & relationships / Andy Mitchell. Redlands, Calif. : ESRI Press, cop. 1999
- Mitchell, Andy. The ESRI guide to GIS analysis. V. 2. Spatial measurements & Statistics / Andy Mitchell. Redlands (California) : ESRI, 2009
- Sistemas y análisis de la información geográfica : manual de autoaprendizaje con ArcGIS / Coordinador, Antonio Moreno Jiménez ; autores, Rosa Cañada Torrecillas ... [et al.] . - 2ª ed. Madrid : Ra-Ma, 2007
- Quirós Hernández, M.. Tecnologías de la Información Geográfica (TIG) : Cartografía, fotointerpretación, teledetección y SIG / M. Quirós Hernández Salamanca : Ediciones Universidad de Salamanca, 2011
- Sommer, Shelly. A to Z GIS : An illustrated dictionary of geographic information systems / Shelly Sommer, Thasa Wade. Redlands : ESRI Press, 2001
- Geospatial Analysis : A Comprehensive Guide to Principles : Techniques and Software Tools / P. Longley, M. Smith y M. Goodchild Leicester : Matador, 2007
- Sistemas y análisis de la información geográfica : manual de autoaprendizaje con ArcGIS / Coordinador, Antonio Moreno Jiménez ; autores, Rosa Cañada Torrecillas ... [et al.] . 2ª ed. Madrid : Ra-Ma, 2007