

25254 - Cartography and geographical information systems

Syllabus Information

Academic Year: 2020/21

Subject: 25254 - Cartography and geographical information systems

Faculty / School: 201 - Escuela Politécnica Superior

Degree: 277 - Degree in Environmental Sciences
571 - Degree in Environmental Sciences

ECTS: 9.0

Year: 1

Semester: First Four-month period

Subject Type: 277 - Optional

571 - Compulsory

Module: ---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, practice sessions, tutorials, fieldwork, exams and autonomous work and study.

4.2.Learning tasks

This course is organized as follows:

- **Lectures.** Among the sessions developed in the classroom, participatory activities will consist of lectures and resolution of cases and problems. In these sessions students will raise some assignments or exercises to be solved as academically supervised activities.
- **Practice sessions** will take place mainly in the computer room and drawing classroom. The students will perform various mapping exercises that require the use of different tools (software GPS, cartographic design and geographic information systems) and specific cartographic material (stereoscopes, aerial photographs, maps, etc.).
- **Fieldwork** will learn management targeting techniques and spatial location: GPS, compass and topographic map.
- **Tutorials.** Teachers will attend students during office hours.

- **Exam.**
- **Autonomous work and study.** Autonomous study of cases, problems, mapping, etc.

4.3.Syllabus

This course will address the following topics:

Section 1. Conceptual framework of cartography

1. General concepts: introduction to cartographic documents
2. Cartographic sources for environmental studies

Section 2. Fundamentals of geodesy

1. Geodesy: ellipsoid, geoid, datum
2. Spatial reference (planimetry, altimetry)
3. Geodetic coordinate system

Section 3. Topographic cartography

1. Geographical coordinates and cartographic projection systems
2. UTM Coordinates
3. Orientation. North - South.
4. Topographic map interpretation

Section 4. Fundamentals of geographic information systems

1. Definition and application of Geographic Information Systems for environmental studies
2. Models and structures of data
3. Collection, organization and maintenance of information
4. Data visualization
5. Functions of spatial analysis
6. Map composition

Section 5. Photointerpretation

1. Existing aerial coverage in Spain: characteristics and utility for the environmental analysis of territory
2. Interpreting aerial photography: lithology, relief, vegetation and uses of soil

Section 6. Cartographic design and thematic cartography

1. Cartographic design: fundamental concepts of cartographic design, visual variables, colour, map composition
2. Thematic cartographic: definition and components of thematic maps, processing information, cartographic representation of the information

Section 7. Introduction to remote sensing

1. Basic concepts and applications of Remote Sensing in Environmental Sciences

Section 8. Spatial referencing

1. Satellite navigation systems
2. Recording data
3. Navigation and spatial point search

SYLLABUS IN DETAIL

Section 1

- In the classroom they will present numerous examples of cartography, both through PowerPoint presentations, as of the access to the principal servers of maps in digital format.
- The student, individually, perform a map search for a particular municipality and prepare a brief report that will deliver the teacher and will be part of the evaluation activities.

Sections 2 and 3

Accomplishment of the following activities:

- Theoretical - practical test proposed by the teacher

The content of these test will include:

Theoretical topics: (theoretical answers)

- Geographical coordinates and cartographic projection systems
- UTM Coordinates
- Orientation. North - South
- Geodesy: ellipsoid, geoid, datum
- Spatial reference (planimetry, altimetry)
- Geodetic coordinate system

Practical topics: (numerical answers)

- Scales (drawings, planes, maps, photocopies): linear, superficial, volumetric
- Graphical scales: construction, use, resolution
- Angles used in cartography: orientation, azimuth, heading (relation between the three 'norths': grid, geographical, magnetic)
- Location of cartographic information (national) in 'real time'.
 - Accomplishment and exhibition (in front of the class) of a work realized in team; the above mentioned work will focus on the theoretical - practical contents seen in Cartography and Geodesy.
 - Theoretical - practical test proposed by the students.

The content of these test will focus on the works realized in the previous point.

The student will be able to perform the test proposed at home as many times as he want, since it is implemented in " ADD Unizar-Moodle 2 " (where the highest score is saved), and these will serve as methodology of study. The minimum score to pass them will be 9.

Section 4

In the practical sessions, several exercises that imply the utilization of GIS software will be covered. In addition, as directed work, the students will have to design and implement a small project related to an environmental supposition where there are applied some of the acquired knowledge.

Section 5

- Through PowerPoint's presentations, significant examples will be exposed of how photointerpreting different elements of the environmental variables such as geology, topography, vegetation and land use. Finally, in the practical sessions, the students will photointerpret aerial photographs and ortofotos, some of which will use in the course of Ecology II.

Section 6

- At the theoretical sessions, through lectures supported by PowerPoint presentations, will be exposed the conceptual basic notions which will complement with the consultation and comment of examples of different thematic maps. In the practical sessions, students will design and implement a legend in the cartography realized from photointerpretation.

Section 7

- In the theoretical sessions there will be exposed the basic theoretical fundamentals, and some significant examples of remote sensing applications; and in the practical sessions, the students will display images of satellite and will realize some basic operations.

Section 8

- The students will perform in groups a capture of data with GPS (GLOBAL POSITIONING SYSTEM) and a navigation to a point.

4.4.Course planning and calendar

Activity / Week	1	2	3	4	5	6 ⁽¹⁾	7	8	9	10 ⁽²⁾	11	12	13	14	15
<i>Face-to-face Activity</i>															
Theory	3	4	2	2	2	2	2	2	2	2	2	2	2	2	2
Problems															
Laboratory	2	2	4	4	2	4	4	4	4	4	4	4	4	4	4
Group work															
Field work															
Tutorials ECTS		1			1		1		1			1	1	1	
Exam															
<i>Non face-to-face activities</i>															
Individual work	6	5	6	6	6	6	6	6	6	6	6	5	6	6	10
Group work															
TOTAL	11	12	12	12	11	12	13	12	13	12	12	12	13	13	10

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the Faculty of Sciences website and Moodle.

4.5.Bibliography and recommended resources

- BB** Collado Latorre, J.C. ArcGIS 10: prácticas paso a paso. Valencia : Editorial Universitat Politècnica de Valencia, 2013 [Comentario del profesor: libro electrónico]
- BB** Elementos de cartografía/ Arthur H. Robinson...[et al.]; [traducción por Rosa Ma Ferrer]. ed. española revisada por Josep M. Rabella i Vives, Josep M. Panareda i Clopés. Barcelona : Omega, D.L. 1987
- BB** 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
- BC** Bernhardsen, Tor. Geographic information systems : an introduction / Tor Bernhardsen. 3rd ed. New York : John Wiley & Sons, cop. 2002
- BC** Chuvieco Salinero, Emilio. Teledetección ambiental : la observación de la Tierra desde el espacio / Emilio Chuvieco. 1ª ed. act. Barcelona : Ariel, 2010
- BC** Fernández García, Felipe. Introducción a la fotointerpretación / Felipe Fernández García. 1a. ed. Barcelona : Ariel, 2000
- BC** Mancebo, S., et al. (2008): Libro SIG: aprendiendo a manejar los SIG en la gestión ambiental. Madrid: Autores
- BC** Peterson, Gretchen N. GIS cartography : a guide to effective map of design / Gretchen N. Peterson. Boca Raton : CRC Press, cop. 2009

- BC** Sistemas de información geográfica : aplicaciones en diagnósticos territoriales y decisiones geoambientales / coordinadores, Antonio Moreno Jiménez, Gustavo D. Buzai, Manuel Fuensalida Díaz ; autores, Claudia A. Baxendale ... [et al.] . 2ª ed. act. Paracuellos de Jarama, Madrid : Ra-Ma, 2017
- BC** Thematic cartography and geographic visualization / Terry A. Slocum ... [et al.]. 2nd ed. Upper Saddle River, NJ : Pearson/Prentice Hall, cop. 2005
- BC** Thematic cartography and geovisualization / Terry A. Slocum ... [et al.]. 3rd ed. Upper Saddle River, NJ : Pearson Prentice Hall, cop. 2009
- BC** Tyner, Judith A. Principles of map design / Judith A. Tyner. New York [etc.] : Guilford, 2010

LISTADO DE URLs:

Mancebo, S., et al. (2008): Libro SIG: aprendiendo a manejar los SIG en la gestión ambiental. Madrid: Autores
[http://oa.upm.es/1244/1/Mancebo_Quintana_SIG_2008a.pdf]

The updated recommended bibliography can be consulted in:
<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=25254>