Universidad Zaragoza

Year : 2020/21

28721 - Cartography, Geographical Information Systems and Remote Sensing

Syllabus Information

Academic Year: 2020/21
Subject: 28721 - Cartography, Geographical Information Systems and Remote Sensing
Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia
Degree: 423 - Bachelor's Degree in Civil Engineering
ECTS: 6.0
Year: 3
Semester: First semester
Subject Type: Compulsory
Module: ---

1.General information

1.1.Aims of the course

The subject and its expected results respond to the following approaches and objectives:

Cartography, S.I.G. and Remote Sensing are basic tools that allow us to know and manage the terrain on which civil engineering projects are executed. They are indispensable instruments to be able to design and execute the activities that the engineer must undertake in relation to the terrain

1.2.Context and importance of this course in the degree

The degree of Civil Engineering works on the territory. That is why you need an instrumental subject that allows you to take data from that territory, as well as graphically represent them for proper use. With the subject of Topography, taken in the previous course, and the geographic information technologies (TIG) that are integrated in this subject, it is intended to know all the territorial variables that allow us to generate models on which to work on projects of Engineering.

The course aims to complement the Topography, which takes place in the third semester, thus being able to integrate in the cartography the topographic information, the geotechnical characteristics and any other variables related to the terrain that we need to geo-reference.

1.3.Recommendations to take this course

To take this subject with use, it is recommended to have previous knowledge of:

- Methods and systems of representation of the environment.
- Concept and management of projection systems.
- CAD application.
- Topography.

2.Learning goals

2.1.Competences

Upon passing the subject, the student will be more competent to ...

Organizational and planning capacity (G01).

Ability to solve problems (G02).

Ability to make decisions (G03) .

Aptitude for oral and written communication in the native language (G04).

Analysis and synthesis capacity (G05).

Information management capacity (G06).

Ability to work in a team (G07).

Ability for critical reasoning (G08).

Ability to work in an international context (G10).

Improvisation and adaptation ability to face new situations (G11).

Positive social attitude towards social and technological innovations (G13).

Ability to reason, discuss and present ideas (G14).

Ability to communicate through words and images (G15).

Ability to search, analyze and select information (G16).

Ability for autonomous learning (G17).

Know and understand respect for fundamental rights, equal opportunities between women and men, universal accessibility for people with disabilities, and respect for the values of the culture of peace and democratic values (G23)

Possess and understand knowledge in an area of study that starts from the general secondary education base, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that involve knowledge from the avant-garde. from your field of study (CB1).

Apply their knowledge to their job or vocation in a professional way and possess the competencies that are usually demonstrated through the elaboration and defense of arguments and problem solving within their area of study (CB2).

Ability to collect and interpret relevant data (usually within their study area) to make judgments that include a reflection on relevant issues of a social, scientific or ethical nature (CB3).

Transmit information, ideas, problems and solutions to both a specialized and non-specialized audience (CB4).

Develop those learning skills necessary to undertake further studies with a high degree of autonomy (CB5).

Manage techniques for creating synthesis cartographies applicable to territorial management based on the cartographic analysis of geographic information. Understand the conceptual and theoretical foundations of Geographic Information Systems, remote sensing and cartography, the correct use of terminology proper to these disciplines and the identification and analysis of basic information about them (C01)

2.2.Learning goals

The student, to pass this subject, must demonstrate the following results ...
Ability to prepare meaningful cartographic documents for the problem of Civil I., being able to identify the design process implicit in the thematic maps for use in Civil Works projects.
Ability to prepare and interpret the graphic documentation of a project, referring to the cartography usable in it.
Ability to work with the different types of cartographic materials currently used in civil engineering.
Ability to identify the criteria that allow territorial decision-making based on cartography and evaluate the usefulness and quality of the most common cartographic employment documents for this purpose.
(GIS) and the principles, concepts and elements for modeling geographic information for incorporation and management in GIS, reasonably describing the analysis functions of this technology
Ability to explain the conceptual aspects of remote sensing as a geographic analysis tool in relation to planning and spatial planning.

2.3.Importance of learning goals

GITs are not simple computational tools, nor are they reduced to skills in the management of computing resources, since they require a solid training in "spatial thinking". This requires a critical understanding of the theoretical and conceptual foundations. In this course the foundations are laid for the modeling of geographic information and the acquisition of basic skills in the management of computer resources, for the correct interpretation of satellite images and for the application of cartographic principles. Together, these capacities allow evaluating and offering solutions to land-use planning problems. The learning achieved in the subject responds to the instrumental training of the graduate who works in the various facets of Civil Engineering

3.Assessment (1st and 2nd call)

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

The student must demonstrate that they have achieved the expected learning outcomes through the following assessment activities

At the beginning of the course the student will choose one of the following two assessment methodologies:
? Continuous Assessment System: characterized by the obligation to take and pass practical tests, partial exams and academic work proposed in the subject, within the deadlines established for this purpose. To opt for the Continuous Assessment system, you must attend at least 80% of the face-to-face activities (practices, technical visits, classes, etc.).
? Non-continuous evaluation system: The student must compulsorily take a global test, being able to voluntarily carry out individual academic assignments in the continuous evaluation methodology.
The deadline and mode of delivery of practical tests and academic work will be indicated in the planning of the subject.
In the continuous assessment model, the teacher will evaluate the student's participation in the theoretical classes, the demonstration of the knowledge acquired and the ability to solve problems that the teacher will observe in the practical classes.
Likewise, the work / projects carried out by the student will be evaluated.
Lastly, the student must take several written or practical tests ("continuous assessment exams") for each part of the subject.
The following table summarizes the indicative weights of the parts mentioned in the evaluation process.
Oral tests in theory classes 5%
Oral tests in practical classes 5%
Theoretical exams 45%
Practical work 20%
Practical test 25
All students, who do not exceed the necessary minimum required of the practical tests, exams or academic work proposed in the subject, or voluntarily renounce the model in the course, will automatically go to the non-continuous evaluation model.
However, the student will always be able to present themselves to improve their grade by taking the global test, with the final grade being the one that is the highest obtained, be it from the elimination tests carried out during the course or from the global test.
Non-continuous evaluation system.
The student must opt for this modality when, due to their personal situation, they cannot adapt to the pace of work required in the continuous evaluation mode, they voluntarily choose this evaluation mode or are excluded from the continuous evaluation mode.
The student may choose one of the two non-continuous assessment models, the general characteristics of which are:
? **Absolutely non-continuous evaluation**, in which the evaluation consists of a global test of theory and practice of the contents of the subject, on the dates set by the center, for each of the two official calls.
? q**uasi-continuous evaluation,** in which the student will carry out the individual works proposed in the continuous evaluation, in addition to taking the global theory and practice test, on the dates set by the center, for each of the two official calls.
Throughout the course, the evaluation system may be varied, depending on the evolution of your personal situation.
The following table summarizes the maximum indicative weights of the parts mentioned in the evaluation process.

Oral tests in class 0%
Jobs 0% (30%)
Continuous assessment exams 0%
Global Test 100% (70%)

Absolutely non-continuous (quasi-continuous) evaluation process weights.

Note: In any case, the evaluation method must comply with what is regulated in the Regulation of Learning Evaluation Standards, approved by Agreement of 22/12/2010 of the Governing Council of the U.Z.
Assessment calendar.
The dates of the continuous assessment partial exams will be published in the Notices forum of the subject's Moodle virtual platform
The dates of global exams and validation will be the official dates published at:
https://eupla.unizar.es/asuntos-academicos/examenes

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The learning process that has been designed for this subject is based on the following:
The course consists of 6 ECTS credits, which represents 150 hours of student work in the course during the semester. 40% of this work (60 hours) will be face-to-face activities, tutored by the teachers of the subject, and the rest will be autonomous.
A semester will consist of 15 teaching weeks, for which 4 hours / week of face-to-face classes (theory, practical exercises and field practices) are scheduled for each group.
To make the temporal distribution, the teaching week is used as a measure, in which the student must dedicate 10 hours to the study of the subject.
A summary of the indicative time distribution of a teaching week can be seen in the following table. These values are obtained from the subject of the Verification Report of the degree title.

Degree of Experimentality: High
theory classes 2 hours
practical classes 2 hours
Autonomous activities 6 hours

If classroom teaching were not possible due to health reasons, it would be carried out on-line

4.2.Learning tasks

The teaching methodology is based on a strong teacher / student interaction. This interaction is materialized through a division of work / responsibilities between students and teachers.

A.- On-site activities:
1. Theoretical classes: The theoretical concepts of the subject will be explained and problems and practical examples will be developed.
2. Practical exercises: Students will develop examples and carry out practical cases in the classroom referring to the theoretical concepts studied.

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3. Field practices: The students, organized in work groups, will carry out data collection with the teams in the field, data processing with the software and subsequent writing of the report and / or transposition of the results in the field.
B.- Autonomous tutored activities:
1. These activities will be tutored by the teachers of the subject through individual or group physical tutorials and open forums on the Moodle platform.
C.- Reinforcement activities:
1. Through a virtual teaching portal (Moodle) various activities will be directed to reinforce the basic contents of the subject, as well as the provision of the corresponding subject forum moderated by the teacher. These activities will be personalized and controlled through the virtual portal system.

ORGANIZATION OF TEACHING
? **Expository classes**: Theoretical and / or practical activities taught fundamentally expositively by the teacher.
? **Classroom practices and seminars**: Activities of theoretical discussion or preferably practical ones carried out in the classroom and that require high student participation.
? **Field practices and computer room:** Practical activities carried out in the field and in the computer room directed by the practical teacher.
? **Group tutorials:** Scheduled learning follow-up activities in which the teacher meets with a group of students to guide their autonomous learning tasks and to supervise directed work or that require a very high degree of advice from the teacher.
? **Individual tutoring**: they can be face-to-face or virtual through the Moodle platform.

4.3.Syllabus

The following table shows the contents to be taught. These correspond to the topics presented in the content of the subject.

Theoretical Agenda

Topic 1 ? Cartography
1.1. Cartography. Types of maps
1.2. Cartographic production centers.
1.3. Digital mapping

Study guide. It offers a general introduction to the subject and a reminder and fixation of the previous basic mapping concepts. Management of the available cartographic bases.

Unit 2. ? Maps: Coordinates.
2.1. Cartographic projection systems. The U.T.M.
2.2. Conventional representation and Digital modeling.
2.3. Scale and measurements.

Study guide. The aim is to provide criteria for understanding the concept of a-scale in order to be able to extract quantitative information from the available cartography and its use in Civil Engineering.

Topic 3. ? SIG
3.1. Basic concepts of a Geographic Information System
3.2. Characteristics of a GIS, components, functionality. Metadata Vector and raster models.
3.3. Applicable criteria in the design of the components of a GIS.
3.4. Structuring of information.
3.5. Information analysis, Spatial analysis procedures.
3.6. Disclosure of information.

Study guide. It is intended that the student be able to understand and use the different Geographic Information Technologies.

Unit 4 ? Basic principles of remote sensing.
4.1. Remote sensing concept. Physical principles. Systems and resolutions. Types of platforms.
4.2. Interpretation of images. Visual and digital analysis.
4.3. Geometric correction of images. Georeferencing.

Study guide. A study is made of the different methods usable for remote sensing, to know the organizations, institutions and companies that produce the cartographic material, in order to be able to analyze the suitability of each one to the different circumstances of the terrain and the purpose of the work. Learn to read documents fluently to identify the geographic facts present in aerial photographs and spatial images, identifying it with reality.

Practices

Practice 1. Handling of cartographic information

Practice 2. Information platforms
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Practice 3. Basic Qgis course

Practice 4. Qgis applications

Practice 5. Obtaining and interpreting images

Practice 6 Integrated work to design a GIS model

4.4.Course planning and calendar

Calendar of face-to-face sessions and presentation of works

The following table shows the contents to be taught. These correspond to the topics presented in the content of the subject.

Week Content
1 Topic 1: Cartography: Basic notions
2 Topic 1: Cartography: Applications
Practice 1: management of cartographic resources in IDEs
3 Topic 2: Maps and coordinate systems: General concepts and scales.
Practice 2: handling physical maps
4 Topic 2: Maps and coordinate systems

Practice 3: Work on cartographic information
5 Topic 2: Maps and coordinate systems
Practice 4: GIS, options and environments
6 Topic 3: S.I.G. : Basic principles
Practice 5: SIG I
7 Topic 3: S.I.G. : Features, components and functionality
Practice 6: SIG II
8 Evaluation topics 1 and 2
Practice 7: SIG III
9 Topic 3: S.I.G. : Structure and analysis of information
Practice 8: SIG IV
10 Topic 3: S.I.G.
Practice 9: SIG V
11 Unit 4: Remote sensing: Basic principles.
Practice 10: SIG VI
12 Topic 5: Remote sensing: Image interpretation.
Practice 11: Aerial photogrammetry
13 Topic 5: Remote Sensing: Georeferencing
Practice 12: SIG VII
14 Practice 13: Integrated mapping work with GIS.
15 Individual tests for practical evaluation.

The dates of the continuous assessment partial exams will be published in the Notices forum of the subject's Moodle virtual platform and the global tests will be officially published at:
https://eupla.unizar.es/asuntos-academicos/examenes

The weekly schedule of the subject will be delivered to the students in the presentation of the subject and will be kept updated in the virtual classroom of the Moodle teaching platform. The dates of the final exams will be those officially published on the EUPLA website

4.5.Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=28721&year=2020