Universidad Zaragoza

Year : 2019/20

28914 - Topography, cartography and photogrammetry

Syllabus Information

Academic Year: 2019/20
Subject: 28914 - Topography, cartography and photogrammetry
Faculty / School: 201 - Escuela Politécnica Superior
Degree: 437 - Degree in Rural and Agri-Food Engineering
583 - Degree in Rural and Agri-Food Engineering
ECTS: 6.0
Year: 2
Semester: First semester
Subject Type: Compulsory
Module: ---

1.General information

1.1.Aims of the course

This subject contributes to the learning of several key instrumental techniques in training graduate in Agri-Food and Rural Environmental Engineering. So mapping and surveying is a basic tool for designing and laying out of works promoted by the private and / or public sector. For the proper management of the territory it is necessary to know the territory management tools such as Geographic Information Systems (GIS). The learning achieved in the subject responds to instrumental training graduate working in the fields of consulting, management, and environmental impact assessment.

1.2.Context and importance of this course in the degree

The graduate in Agricultural Engineering and Rural Affairs should work on the territory. That is why he needs an instrumental subject to show him how data collection, and how they are represented. He must also achieve skills of the definition and design of the works design engineer on the territory and rethought, at the same time managing the territory.

That is why the knowledge acquired in this course, serves as basic tools in a number of subjects of the degree.

1.3.Recommendations to take this course

The students should have prior knowledge acquired in the course of Graphic Expression. Specifically, they should know Topography applications (Descriptive Geometry), longitudinal and transverse profiles. Prior knowledge are also required in Computer Aided Design

2.Learning goals

2.1.Competences

1: CG.2. Students can apply their knowledge to their work or vocation in a professional manner and have competences typically demonstrated through devising and defending arguments and solving problems within their field of study.

2: CG.3. Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical.

3: CG.5. Students have developed those skills needed to undertake further studies with a high degree of autonomy.

4: CG.7. Students have the ability to use information and communications technology applied to their field of work.

5: CG.8. Students have the ability to work in teams

6: CE.14. Skills to recognize, understand and use the principles of topographic surveys and stakeout; cartography, photogrammetry, GIS and remote sensing in agriculture.

7: Management of topographic equipment, GPS, Total Station and Level.

8: Operation and use of tools of civil engineering and construction staking.

9: Conducting a survey, import the data into a computer application, performing a small agricultural project and staking this. Using orthophotos and Geographic Information System.

2.2.Learning goals

1: It is able to read and interpret cartographic topographic maps.

2: It is able to take data from the territory and represent cartographic and topographically.

3: It is able to handle GPS-RTK surveying instruments, GPS metric, total station and laser optical level.

4: It is able to do, with data taken in the field of the territory, a basic linear design work.

5: It is able, using topographic media, to stake out a linear work.

6: It is able to use a Geographic Information System.

7: It is able to use the information obtained by air-space media.

2.3.Importance of learning goals

This subject contributes to the learning of several key instrumental techniques in training graduate in Agri-Food and Rural Environmental Engineering. So mapping and surveying is a basic tool for designing and laying out of works promoted by the private and / or public sector. For the proper management of the territory it is necessary to know the territory management tools such as Geographic Information Systems (GIS). The learning achieved in the subject responds to instrumental training graduate working in the fields of consulting, management, and environmental impact assessment.

3.Assessment (1st and 2nd call)

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

In this subject a global evaluation will be conducted.

During the course must take the following practical exercises:

- GIS: resolution of a practical case with tools.
- Surveying instruments.

The final exam first and second call will be made in both cases of the following parts.

a): Resolution of a theoretical test: 50%. Score from 0 to 10

In the case of more than one test they shall be weighted according to the number of questions each.

b) Resolution of practical exercises (problems): 50%. Score from 0 to 10

In the case of more than one exercise, the note will be the average of the marks obtained in each of the exercises.

c) Resolution of practical exercises (GIS and Surveying): pass / fail

In the case of having undertaken such practices will not be necessary to do this part in the final examinations.

The rating of the subject is considered approved if the CP weighted rating of the parts ?a' and ?b' is equal to or greater than 5.0 and has obtained a rating equal to or greater than 4.5 in each. In the case of one of the exercises is qualified below 4.5 points, the final score of the subject CF to place on record is:

If weighted score, CP> 4.0, CF = Suspense, 4.0.

If weighted score, CP <4.0, CF = Suspense, CP.

In the case of passing the parts a and b and have not passed the part c (GIS practices or Surveying), the final grade will be Suspense 4.

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

Classroom activities are those involving teachers and students in person and can develop in different areas of EPS (theory classroom, computer classroom, drawing classroom, teacher's office) or outside the school (fieldwork).

Among the sessions developed in the classroom theory, 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.

The practise sessions will take place mainly in the computer room and classroom drawing. The students will perform various mapping exercises that require the use of different tools (software GPS, topographic mapping software design and geographic information systems) and specific map data (aerial photographs, maps and plans etc.).

Fieldwork will learn different management techniques for data collection and stakeout with different surveying instruments: GPS, Total Station and Level, and topographic map.

Tutorials (in this case referred to in programming and attendance, the different character of the optional tutorials to which every student is entitled) aim to track orders that students must solve. The tutorials are developed in the teacher's office.

Finally, another classroom activity is examination to be held in the usual classroom and in the computer room.

Non-contact activities consist basically reading and understanding the "Studio" as well as conducting a series of commissions (cases, problems, etc.) directed academically. These activities will be conducted with full freedom time.

4.2.Learning tasks

The course includes the following learning tasks:

PART 1. FRAMEWORK OF THE MAPPING

At the end of the module, the student should be able to identify the basic elements that make up a map and differentiate between basic, applied and thematic maps. To achieve this objective, they are presented in the classroom numerous examples of cartography, both through PowerPoint presentations, access to servers digital mapping and cartographic collection in a varied role. Finally, the student must also be able to find the necessary cartographic sources.

PART 2. FUNDAMENTALS OF GEODESY AND CARTOGRAPHY

Upon completion of the module, the student should be able to understand the shape of the land and the issue of its representation. The student must have clear concepts ellipsoid, datum, map projections, ellipsoidal height and orthometric height. Of all the datum should know and differences over the datum ED50, WGS84 and ETRS89 addition to the UTM projection.

At the end of the module, the student should be able to read a topographic map and understand the full legend of this. The student will perform a reading of a topographic map. You must also know and skillfully use the UTM projection. The student will make a location of UTM coordinates, and distances, and change Time.

PART 3. SURVEYING INSTRUMENTS

At the end of the module, the student should know the use of various topographic devices commonly used. GPS, Total Station and Level. The student must have enough to choose from for each type of job the most suitable for each criterion surveying instrument.

PART 4. MAKING MAPS AND PROJECTS TOPOGRAPHICAL

With the data collected by surveying methods, the student should be able to make a digital terrain model, a flat contour and make the planes defining a basic linear work of a rural road, with its design elements in plan, elevation, transverse and earthmovers as well as to generate listings stakeout. For this purpose, a computer application surveying and design of linear works were used.

PART 5. LAYOUT OF WORKS

The student must be able to perform stakeout works. For this, data have been previously obtained in a survey with instruments that have been presented in module 4 and subsequently have been treated in Module 5. Students should be able to use basic computer applications to convey these points will be used setting out the various surveying instruments and put the various signalling elements of the work in the field (stakes).

PART 6. GEOGRAPHIC INFORMATION SYSTEMS

The student must be able to perform the basic operations of a GIS. Load coverage, digitization of these and most common GIS operations, Intersect, Buffer,... and the cartographic design of these. For this purpose, a computer application of GIS will be used, that students should be able to handle.

PART 7. DATA COLLECTION MODULE WITH AEROSPACE MEDIA BY PHOTOGRAMMETRY AND REMOTE SENSING SATELLITE

This module intends to approach the methods of making aerospace data, aerial photogrammetry made primarily from conventional flying devices (planes, aeroplanes, helicopters, drones,...) using photographic methods and spatial Remote Sensing made from satellite primarily with other sensors. The goal is that students know the basic theoretical fundamentals of this tool, and that values its utility to do this, in lectures will be presented both theoretical content, as some significant examples of their application; and in the practical sessions, students displayed satellite images and perform some basic operation interpretation thereof.

4.3.Syllabus

The course will address the following topics:

MODULE 1. FRAMEWORK OF THE MAPPING

- Types of maps.
- Servers mapping in digital format.
- Cartographic Collections paper.

MODULE 2. FUNDAMENTALS OF GEODESY AND CARTOGRAPHY

- The shape of the land and the issue of its representation.
- Ellipsoid, datum
- Cartographic projections, ellipsoidal height and orthometric height.
- The datum ED50, WGS84 and ETRS89 addition to the UTM projection.
- Location of UTM coordinates, and distances, and Time zone change

MODULE 3. SURVEYING INSTRUMENTS

- GPS.
- Total station
- Level.

MODULE 4. MAKING MAPS AND PROJECTS TOPOGRAPHICAL

- Computer application TCP-MDT.
- Import points.
- Creating a Digital Model.

- Curving.
- Longitudinal, transverse profiles and gradients.
- Earth movements.

5. MODULE LAYOUT OF WORKS

- Staking works

MODULE 6. GEOGRAPHIC INFORMATION SYSTEMS

- Basic operations of a GIS.
- Charging coverage.
- Scanning coverage.
- Advanced GIS operations.
- Cartographic Design of these.

MODULE 7. DATA COLLECTION WITH AEROSPACE MEDIA, PHOTOGRAMMETRY AND REMOTE SENSING SATELLITE

- Fundamentals of aerial photogrammetry
- Fundamentals of Remote Sensing Space.
- Airborne LIDAR.

4.4.Course planning and calendar

Weeks	Parts	Theory	Practice	Test
1	FRAMEWORK OF THE MAPPING	1	2	
2	FRAMEWORK OF THE MAPPING		2	
3	FUNDAMENTALS OF GEODESY AND CARTOGRAPHY	1	2	
4	FUNDAMENTALS OF GEODESY AND CARTOGRAPHY	1	3	
5	SURVEYING INSTRUMENTS		3	
6	SURVEYING INSTRUMENTS		4	
7	SURVEYING INSTRUMENTS		4	
8	MAKING MAPS AND TOPOGRAPHY PROJECTS		4	
9	MAKING MAPS AND TOPOGRAPHY PROJECTS		4	
10	MAKING MAPS AND TOPOGRAPHY PROJECTS		4	
11	MAKING MAPS AND TOPOGRAPHY PROJECTS		4	
12	MAKING MAPS AND TOPOGRAPHY PROJECTS		4	
13	MAKING MAPS AND TOPOGRAPHY PROJECTS		2	2
14	CHRISTMAS HOLIDAY PERIOD			
15	CHRISTMAS HOLIDAY PERIOD			
16	LAYOUT OF WORKS		4	
17	GEOGRAPHIC INFORMATION SYSTEMS	1	2	
18	GEOGRAPHIC INFORMATION SYSTEMS		4	
19	DATA COLLECTION WITH AEROSPACE MEDIA, PHOTOGRAMMETRY AND REMOTE SENSING SATELLITE	1	3	
20	FINAL TEST			3

Programming course: see Moodle UZ.

4.5.Bibliography and recommended resources

BB Domínguez García-Tejero, Francisco. Topografía general y aplicada / Francisco Domínguez García-Tejero . - 13ª ed. corr. y act. Madrid [etc] : Mundi-Prensa, 1998

BB López-Cuervo y Estevez, Serafín. Fotogrametría / Serafín López-Cuervo y Estevez Madrid : Egraf, 1980

BB López-Cuervo y Estevez, Serafín. Topografía / Serafín López-Cuervo y Estévez . - 2a. ed. rev. y act. Madrid : Mundi-Prensa, 1996

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 Chuvieco Salinero, Emilio. Teledetección ambiental : la observación de la Tierra desde el espacio / Emilio Chuvieco . 1ª ed. act. Barcelona : Ariel, 2010

BC Dal-Ré Tenreiro, Rafael. Caminos rurales : proyecto y construcción / Rafael Dal- Ré Tenreiro Madrid : Mundi-Prensa : IRYDA, 1994

BC Diccionario de cartografía : topografía, fotogrametría, teledetección, GPS, GIS, MDT / A.R. Alcalá ... [et al.] ; coordinadora, I. Otero . Madrid : Ciencias Sociales, 1995

BC 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

BC Núñez-García del Pozo, Alfonso. G.P.S. : la nueva era de la topografía / Alfonso Núñez- García del Pozo, José Luis Valbuena Durán, Jesús Velasco Gómez . Madrid : Ediciones de las Ciencias Sociales, D.L. 1992

BC Sistemas de información geográfica : prácticas con PC ARC /INFO e IDRISI / Joaquín Bosque Sendra... [et al.] . Madrid Ra-Ma, 1994

BC Vázquez Maure, Francisco. Lectura de mapas / por Francisco Vázquez Maure y José Martín López Madrid : Instituto Geográfico Nacional, 1986

LISTADO DE URLs:

Alonso, I. (2010): Las coordenadas geográficas y la Proyección UTM. (Universal Transversa Mercator). El datum. Palencia: Universidad de Valladolid - [http://www.cartesia.org/data/apuntes/cartografia/cartografia-geograficas-utm-datum.pdf]

gvSIG - [http://www.gvsig.org/web/]

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

Mancebo, S., et al. (2009). LibroSIG: aprendiendo a manejar los SIG en la gestión ambiental: ejercicios. Madrid: Autores - [http://oa.upm.es/2080/1/MANCEBO_QUINTANA_MONO_2009_01.pdf]

The updated recommended bibliography can be consulted in:
http://psfunizar7.unizar.es/br13/egAsignaturas.php?codigo=28914&Identificador=13130