SUBJECT TEACHING GUIDE

G1960 - TOPOOGRAPHY AND GEODESY

Degree in Civil Engineering

Academic year 2022-2023

1. IDENTIFYING DATA					
Degree	Degree in Civil Engineering			Type and Year	Compulsory. Year 1
Faculty	School of civil Engineering				
Discipline	TOPOOGRAPHY AND GEODESY				
Course unit title and code	G1960 - TOPOOGRAPHY AND GEODESY				
Number of ECTS credits allocated	6	Term		Semester based (2)	
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA GEOGRAFICA Y TECNICAS DE EXPRESION GRAFICA
Name of lecturer	JAVIER MARIA SANCHEZ ESPESO
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Other lecturers	RAUL PEREDA GARCIA

3.1 LEARNING OUTCOMES
- Know the necessity of different reference surfaces: ellipsoid and geoide.
- Know how to manage digital cartography, for the habitual scales
- To create and to edit a digital model of terrain. Obtain profiles, longitudinal and cross, for a simple alignment. Calculation of volumes among surfaces.
- Developing basic measures (distance, surfaces), o between surface models.
- Data collection and use of basic observables captured by the surveying equipment: angles, distances and height differences.
- Know and suitably use the different geodesic corrections must be applied to observables made with surveying equipment.
- Know, design, execute and evaluate the production of cartographic databases by modern photogrammetric methods.
- Know the basics of techniques of space Geodesy. Know how to develop the existent differential methodologies.
- To know the main characteristics of other methodologies used in Civil Engineering : 3D terrestrial laser and LIDAR flights.
- Know how to define geometrically and economically evaluate constructions of linear character in Engineering, like roads, defining the essential elements.
- Determine the precise data to stake out a position.
- Design and plan the auscultation of structures and land.

4. OBJECTIVES
Know the different reference surfaces necessary to obtain the position of a point on the Earth 's surface in a cartographic base and its materialization.
Learn the basic techniques to incorporate entities and obtain measurements on a digital numerical cartographic basis, including the generation and easy operation of a digital terrain model: profiles, volumes.
Know the main methodologies for capture of spatial information using classical instrumentation: total station and digital automatic level; as well as more modern devices such as terrestrial laser scanner.
Understand the use of the UTM projection for the planimetric coordinates, knowing how to reduce and to project the distance observable.
Know the different corrections required for the levelling in the geodesic field . Learn the basics concepts used by other techniques of capture of spatial information: space Geodesy, photogrammetry, LIDAR and terrestrial laser, remote sensing and bathymetry.
Know how to define geometrically and economically evaluate constructions of linear character in Engineering, including the setting out.
Know the main methodologies of auscultation of movement, planimetric and altimetric, applied to structures and earthworks.

6. COURSE ORGANIZATION	
CONTENTS	
1	PART 1.1 Introduction to Surveying and Geodesy. Surveying and Geodesy. Reference systems. Map Projections: UTM projection. Processing and exploitation of numerical cartographic bases. Cartographic bases of reference in Civil Engineering. Treatment of cartographic bases in CAD environment. Creation of digital terrain models of terrain. Basic operations with MDT: profiles, volume calculations and measurements. PART 1.2. Topographic instruments. Angle measurements: theodolite. Distance measurements. Total station and terrestrial laser scanner. Levelling: automatic and digital levels. Topographical classic methodologies with total station: radiation, traverse and intersection.
2	BLOCK 2.1: Basics of Geodesy and Cartography. Geometrical Geodesy. Geodesic treatment of classic observations in planimetry: atmospheric correction and reduction to ellipsoid. UTM projection. Elevation geodetic aspects: visual reciprocal, simultaneous and orthometric correction. Stakeout. BLOCK 2.2: Advanced Topographic-Geodetic Methodologies. Global positioning system using spatial vehicles (GNSS). Photogrammetric Methodologies. Other Methodologies: airborne laser (LIDAR), remote sensing and bathymetry. BLOCK 2.3. Geometric design of roads in Engineering. Creating the MDT. Basic alignments in plant: straight line, circumference and clothoid. Basic alignments in elevation: straight line and parabole. Definition of the cross section. Stakeout. Earthwork Quantities. Obtaining project documents: plans and basic reports. BLOCK 2.4: Geodesic auscultation. Planimetric (with angular observable and observable distance) and altimetry. BLOCK 2.5.: Introduction to Geographic Information Systems.
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7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Block 1. Project about skills with digital cartography.	Activity evaluation with Virtual Media	No	No	10,00
Block 1. Exam of the first block.	Written exam	No	Yes	30,00
Block 2.- Project about skills with GIS.	Activity evaluation with Virtual Media	No	No	10,00
Block 2. Use of total station or automatic level.	Laboratory evaluation	No	No	10,00
Block 2. Project about skills with topographical methodologies	Activity evaluation with Virtual Media	No	No	10,00
Block 2. Exam of the second block	Written exam	No	Yes	30,00
TOTAL				100,00

Observations

The dates of the assessment tests are indicative.
They will be observed the resolutions adopted in the ordinary session of the School meeting celebrated on June 10, 2010.
It will be considered the equivalence among the numeric qualification and the qualitative one established in the Real Decreto RD1125 /2003.
Only for duly justified causes (eg sanitary restrictions), the evaluations may be organized remotely, with prior authorization from the Center's Directorate.

Observations for part-time students

The evaluation will consist of two types of activities:
1. Projects. Corresponding to blocks 1 and 2. On the dates fixed along the course. Percentage: 20%.
2. Exam. Composed of the following parts:
> Theoretical and parctical exam. Percentage: 50%. Minimum grade: 4.
> Laboratory evaluation, instruments and tools. Percentage: 30%. minimum grade: 4.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Ferrer Torio, R; Piña Patón, B. Topografía aplicada a la Ingeniería Civil. Servicio publicaciones ETSI Caminos, Canales y Puertos, Santander.
Chueca Pazos, M., Herráez Boquera, J.; Berné Valero, J.L.: "Tratado de Topografía". Ed. Paraninfo. Madrid. 1.996.
Leick, Alfred: "GPS Satellite Surveying". Editorial John Wiley & Sons. Nueva York. 1.995.
Petrie, B.; Kennie, T.J.: "Terrain Modelling in Surveying and Civil Engineering". Editor Whittles Publishing. Londres. 1.990.
Vázquez Maure, F.; Martín López, J.: "Lectura de mapas". Madrid. 1.995.