

SUBJECT TEACHING GUIDE

G1960 - TOPOOGRAPHY AND GEODESY

Degree in Civil Engineering

First Degree in Civil Engineering

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Degree in Civil Engineering First Degree in Civil Engineering			Type and Year	Compulsory. Year 1 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)		
Knowledge Field					
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				
E-mail	javier.sanchez@unican.es				
Office	E.T.S. de Ingenieros de Caminos, Canales y Puertos. Planta: + 2. DESPACHO PROFESOR (2037)				
Other lecturers	RAUL PEREDA GARCIA				

4. OBJECTIVES

To know the different precise reference surfaces that allow to relate a position on the earth 's surface with its representation on a cartographic base, in both directions.

Learn the basic techniques to incorporate features and obtain measurements on a digital numerical cartographic database, including the generation and simple exploitation of a digital terrain model. Obtaining profiles and measurements.

To know the primary methodologies for capturing spatial information using classical instrumentation : total station and level; as well as more modern instruments such as the terrestrial laser scanner.

To understand the use of the UTM projection for planimetric coordinates , knowing how to reduce and project the observable distance. To know the different corrections required for the observation of unevenness in the geodetic field .

Learn the fundamentals and approach to other spatial information capture techniques: spatial geodesy, photogrammetry, terrestrial laser and LIDAR, remote sensing and bathymetry.

To know how to define geometrically and to value economically the design of a work in engineering , especially of works with a clear linear character, including the staking out.

To know the main methodologies of movement auscultation, planimetric and altimetric, applied to structures and earthworks.

6. SUBJECT PROGRAM

CONTENTS

1	<p>PART 1.1 Introduction to 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.</p> <p>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.</p>
2	<p>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.</p> <p>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.</p> <p>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.</p> <p>BLOCK 2.4: Geodesic auscultation. Planimetric (with angular observable and observable distance) and altimetry.</p> <p>BLOCK 2.5.: Introduction to Geographic Information Systems.</p>
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7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Block 1. Project about skills with digital cartography.	Work	No	No	10,00
Block 1. Exam of the first block.	Written exam	No	Yes	30,00
Block 2.- Project about skills with GIS.	Work	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	Work	No	No	10,00
Block 2. Exam of the second block	Written exam	No	Yes	30,00
TOTAL				100,00
Observations				
<p>The dates of the evaluation exams 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.</p>				
Observations for part-time students				
<p>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.</p>				

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Colección de presentaciones de clase, disponibles en el aula virtual.
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.