

## Course guide 310634 - 310634 - Non-Conventional Surveys

Last modified: 10/02/2025

Unit in charge: Teaching unit:	Barcelona School of Building Construction 751 - DECA - Department of Civil and Environmental Engineering.		
Degree:	BACHELOR'S DEGREE IN GEOINFORMATION AND GEOMATICS ENGINEERING (Syllabus 2016). (Compulsory subject).		
Academic year: 2024	ECTS Credits: 6.0	Languages: Spanish	

## **LECTURER**

Coordinating lecturer: FELIPE BUILL POZUELO

Others:

## **DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES**

#### Specific:

1. (ENG) Comprendre i analitzar els problemes de implantació en el terreny de les infraestructures, construccions i edificacions projectades des de l'enginyeria en topografia, analitzar els mateixos i procedir a la seva implantació.

2. (ENG) Determinar, mesurar, avaluar i representar el terreny, objectes tridimensionals, punts i trajectòries.

3. Design and develope geomatic and topographic projects.

4. (ENG) Gestió i execució de projectes d'investigació, de desenvolupament i d'innovació dins l'àmbit d'aquesta enginyeria.

5. (ENG) Planificació, projecte, direcció, execució i gestió de processos de mesura, sistemes d'informació, explotació d'imatges, posicionament i navegació; modelització, representació i visualització de la informació territorial en, sota i sobre la superfície terrestre.

6. (ENG) Planificació, projecte, direcció, execució i gestió de processos i productes d'aplicació a l'obra civil i l'edificació, dins l'àmbit geomàtic.

7. Capacity of spatial vision and knowlege of the graphic representation techniques, for traditional methods of metric and geometric geometry but also for applications of assisted design by a computer.

8. Knowledge, application and analysis of the processes of treatment of digital images and special information, proceding from airborne and satelite sensors.

9. Knowledge, use and application of the treatment techinques. Analysis of special data. Study of models applied to the engineering and architecture.

10. Knowledge, use and application of instruments and fotogrametric methods and topographic adequated to the realization of noncartographic raisings.

11. Knowledge, use and application of instruments and topographic methods appropiate for the fullfilment of raisings and surveyings.

12. Knowledge and application of methods of minimun adjust quadratic in the scope of topo-geodesic observations, photogrametric and cartographic.

13. Knowledge about application of the geomatic methods and techniques in the the scope of the different enginneries.

14. Knowledge about construction methods; analysis of structures; design, execution and contol of infrastrutures in the work with interdisciplinary teams, knowledge of hidraulics.

#### Generical:

15. Use of teams and instrumental: Capacity to select the necessary ressources to the achievement of the planned goals according to the quality requirements. Use of the teams, in adequated conditions, with professional efficiency and taking into account the limitations of the instruments and its context of use, in relation with the required precissions.

#### Transversal:

16. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.



## **TEACHING METHODOLOGY**

The hours of guided learning consist in, doing theoretical classes (big group) in which the teacher does a brief exposition to introduce the general goals of learning related with the basic concepts of the subject. Afterwards and by practical exercises, he tries to motivate and involve the students in order to participate actively in their learning.

Support material by ATENEA is used: goals of learning by contents, concepts, examples, programation of evaluating activities, guided learning and bibliography. It also consists in problem classes in which are worked, by the resolution of exercises or problems, related with the specific goals of learning of each one of the contents of the subject.

The aim of these problems is to incorporate some of the generic competences.

After each session tasks are proposed for outside of class, that must be worked individually.

Other hours of autonomous learning must also be considered, such as those dedicated to guided readings and the resolution of the problems proposed on the different contents, through the ATENEA virtual campus.

## LEARNING OBJECTIVES OF THE SUBJECT

At the end of the subject the student must be able to:

- Know, use and apply the treatment techniques and analysis of spatial data

- Know, use and apply instruments and topographic and photogrametric methods adequated for the realization of non cartographic surveying.

- Know, use and apply the treatment processes of digital image and spatial information , proceding from aerotransported sensors and satellites.

- Knowledge and application of minimum quadratic adjustment methods in the enviroment of topo-geodesic, photogrametrics and cartographics observations.

## STUDY LOAD

Туре	Hours	Percentage
Hours large group	24,0	16.00
Self study	90,0	60.00
Hours medium group	36,0	24.00

Total learning time: 150 h



## CONTENTS

## NON CONVENTIONAL SURVEYINGS

## **Description:**

Introduction Quantity risings Architectural risings Archaeological risings Industrial risings Bathymetric risings Topographic metrology. Auscultation Subsoil prospecting Other risings

#### **Specific objectives:**

Introduce the student to the different types of non cartographic surveying, especially the ones that are focused on patrimony, the industrial topography, the topographic auscultation, the batimetric surveyings, the prospecting of subsoil and other non conventional surveyings.

**Related activities:** Activity 1

**Full-or-part-time:** 9h Theory classes: 3h Self study : 6h

#### **METHODS AND INSTRUMENTS**

## **Description:**

Metrology concepts Deiscrete capture systems Massive capture system of data Total stations Photogrametry TLS Frame grabber 3D Other systems

#### Specific objectives:

Description of the metrology systems necessary for the obention and treatmentof one of the special data obteined with the massive capture systems

Description of: systems of discrete capture, massive data capturing systems, total stations, digital phogrametria, TLS, frame grabber 3D, and other systems.

**Related activities:** Activity 2

#### Full-or-part-time: 16h

Theory classes: 4h Practical classes: 4h Self study : 8h



## PATRIMONY. ARCHITECTONIC AND ARCHEOLOGICAL SURVEYING

## **Description:**

Introduction Metodologic bases for the geometric documentation of the patrimony The project of geometric documentation of the patrimony Architectonic and archeological surveying Quality control and validation of results

# Related activities:

Activities 3, 4 and 5

Full-or-part-time: 46h Theory classes: 6h Practical classes: 10h Self study : 30h

#### SPECIAL SURVEYINGS. SPECIAL METHODS AND INSTRUMENTS

#### **Description:**

Radargrammetry and interferommetry SAR (DInSAR, GB-SAR, SAR) Topographic metrology. Auscultation. Movement controls. Documentation of construction. Geometric analysis of structures. Accident analysis. Other systems.

**Full-or-part-time:** 36h Theory classes: 5h

Practical classes: 10h Self study : 21h

## **BATIMETRIC SURVEYING**

## **Description:**

Description of the topographic methods in batimetry. Other methods to obtain batimetric cartography. Official batimetry in Spain

### **Full-or-part-time:** 14h Theory classes: 4h Self study : 10h

## SPECIAL PROJECT

**Description:** Deffense of a project about one of the developed aspects in class. Evaluated test (50%)

**Related activities:** Activity 6

Full-or-part-time: 1h Theory classes: 1h



## ACTIVITIES

## **1 TOPOGRAPHIC SURVEYING**

#### **Description:**

Practices with total station and terrestrial laser scanner

#### **Specific objectives:**

- $\cdot$  Know the limitations of the technique and its most usual applications
- · Effectuate the topographic take necessary for asurveying with a laser scaner
- $\cdot$  Take in an adequated way the control points and the necessary measurements to orientate

#### Material:

File with information on the virtual campus (ATENEA)

**Delivery:** Memory of the practice

#### Full-or-part-time: 5h

Practical classes: 3h Laboratory classes: 2h

## 2 TOPOGRAPHIC METROLOGY

#### **Description:**

Obtaining the field data with topographic and photogrametric instruments.

#### **Specific objectives:**

Show the different mathematic and instrumental tools that can be used in obtaining spatial data for its modelling and representation.

#### Material:

File with information in the virtual campus (ATENEA)

**Delivery:** Memory of the practice

## Full-or-part-time: 5h

Practical classes: 3h Laboratory classes: 2h

#### **3 PHOTOGRAPHIC COVERAGE**

#### Description:

Carrying out photographies in a study case

## Specific objectives:

- $\cdot$  Know the technique limitations and the more usual applications.
- $\cdot$  Do the necessary photographic taking to obtain a surveying of an architectonic elevation and a 3D model.

Material:

File with information in the virtual campus (ATENEA)

**Delivery:** Memory of the practice

Full-or-part-time: 2h Practical classes: 2h



## **4 PHOTOGRAMETRIC ELEVATION 1**

## **Description:**

Adjustment of the photogrametric block. Orientation

#### Specific objectives:

- $\cdot$  Know the technique limitations and the more usual applications.
- · Do the necessary photographic taking, control points and measurements to orientate and obtain a 3D model.

Material:

File with information in the virtual campus (ATENEA)

**Delivery:** Memory of the practice

**Full-or-part-time:** 5h Practical classes: 2h Laboratory classes: 3h

## **5 PHOTOGRAMETRIC SURVEYING 2**

#### **Description:**

Obtention of the graphic documentation. Elaboration of elevation drawings, floor plans, sections and architectonic models in 3D from spatial data with photogrametric techniques.

#### **Specific objectives:**

- · Know the most usual applications
- · Obtaining the graphic documentation: making elevation drawings, floor plans, sections and 3D models.

#### Material:

File with information in the virtual campus (ATENEA)

**Delivery:** Memory of the practice

## Full-or-part-time: 5h

Practical classes: 2h Laboratory classes: 3h

## **6 SPECIAL PROJECT**

#### **Description:**

Carry out a memory about one of the aspects developed in class

#### Material:

File with information in the virtual campus (ATENEA)

#### **Delivery:**

Carrying out a memory and a deffense of one of the aspects developed in class

# **Full-or-part-time:** 6h Self study: 5h

Theory classes: 1h



## **GRADING SYSTEM**

The final qualification is addition of the following partial qualifications: Classroom activities and mandatory readings: 50% Final proof 25 % + defense 25 % Recovery exam is NOT performed

## **EXAMINATION RULES.**

Practices are mandatory. You must have completed all the practices to obtain the average grade Failure to complete or deliver any practice will be considered as a final grade NOT PRESENTED

## **BIBLIOGRAPHY**

#### **Basic:**

- Almagro Gorbea, Antonio. Levantamiento arquitectónico. Granada: Universidad de Granada, 2004. ISBN 8433831909.

- Atkinson, K. B. Close range photogrammetry and machine vision [on line]. Caithness: Whittels Publishing, 2001 [Consultation: 03/06/2020]. Available on: <u>https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=5311623</u>. ISBN 978-1870325-73-8.

- Cramer, Johannes. Levantamiento topográfico en la construcción : medición y reconocimiento. Barcelona: Gustavo Gili, 1986. ISBN 8425212804.

- Greve, Clifford W. . Digital photogrammetry : an addendum to the manual of photogrammetry. Bethesda: American Society for Photogrammetry and Remote Sensing, 1996. ISBN 1570830371.

- Lerma García, José Luis. Fotogrametría moderna : analítica y digital. Valencia: Universitat Politècnica de València, 2002. ISBN 8497052102.

- Lerma Garcia, José Luis ; Biosca Tarongers, Josep Miquel. 3D risk mapping : teoría y práctica del escaneado láser terrestre [on line]. Valencia: UPV, 2008 [Consultation: 07/05/2020]. Available on: http://jllerma.webs.upv.es/pdfs/Leonardo Tutorial Final vers5 SPANISH.pdf.

## RESOURCES

#### Hyperlink:

- ICOMOS. Títol: Carta internacional sobre la conservació i la restauració de monuments i de conjunts històric-artístics, II Congrés Internacional d'Arquitectes i Tècnics de Monuments Històrics, Venècia 1964. Aprovada per ICOMOS el 1965.

- INTBAU