

## Course guide

### 310634 - 310634 - Non-Conventional Surveys

**Last modified:** 19/12/2023

**Unit in charge:** Barcelona School of Building Construction  
**Teaching unit:** 751 - DECA - Department of Civil and Environmental Engineering.

**Degree:** BACHELOR'S DEGREE IN GEOINFORMATION AND GEOMATICS ENGINEERING (Syllabus 2016).  
(Compulsory subject).

**Academic year:** 2023    **ECTS Credits:** 6.0    **Languages:** Spanish

#### LECTURER

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**Coordinating lecturer:** FELIPE BULL POZUELO

**Others:**

#### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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##### 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 develop 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 knowledge 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, proceeding from airborne and satellite sensors.
9. Knowledge, use and application of the treatment techniques. Analysis of special data. Study of models applied to the engineering and architecture.
10. Knowledge, use and application of instruments and photogrametric methods and topographic adequate to the realization of non-cartographic raisings.
11. Knowledge, use and application of instruments and topographic methods appropriate for the fulfilment of raisings and surveyings.
12. Knowledge and application of methods of minimum adjustment quadratic in the scope of topo-geodesic observations, photogrametric and cartographic.
13. Knowledge about application of the geomatic methods and techniques in the scope of the different engineering.
14. Knowledge about construction methods; analysis of structures; design, execution and control of infrastructures in the work with interdisciplinary teams, knowledge of hydraulics.

##### General:

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

##### 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

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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 is work, 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

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At the end of the subject the student must be capable of:

- 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 observations, photogrametrics and cartographics

## STUDY LOAD

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Type	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 in the different types of non cartographic surveying, in special the ones that are focused on patrimony, the industrial topography, the topographic auscultation, the bathymetric surveyings, the prospecting 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  
Discrete capture systems  
Massive capture system of data  
Total stations  
Photogrammetry  
TLS  
Frame grabber 3D  
Other systems

**Specific objectives:**

Description of the metrology systems necessary for the obtaining and treatment of one of the special data obtained with the massive capture systems

Description of: systems of discrete capture, massive data capturing systems, total stations, digital photogrammetry, 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

Methodologic 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 interferometry 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:**

Defense 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:**

- Know the limitations of the technique and its most usual applications
- Effectuate the topographic take necessary for asurveying with a laser scanner
- Take in an adequated way the control points and the measurements necessities 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 photographs in a study case

**Specific objectives:**

- Know the technique limitations and the more usual applications.
- 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:**

- 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

Theory classes: 1h

Self study: 5h



## GRADING SYSTEM

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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.

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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

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### Basic:

- Almagro Gorbea, Antonio. Levantamiento arquitectónico. Granada: Universidad de Granada, 2004. ISBN 8433831909.
- Cramer, Johannes. Levantamiento topográfico en la construcción : medición y reconocimiento. Barcelona: Gustavo Gili, 1986. ISBN 8425212804.
- 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](http://jllerma.webs.upv.es/pdfs/Leonardo_Tutorial_Final_vers5_SPANISH.pdf).
- Atkinson, K. B. Close range photogrammetry and machine vision [on line]. Caithness: Whittels Publishing, 2001 [Consultation: 03/06/2020]. Available on: <https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=5311623>. ISBN 978-1870325-73-8.
- Greve, Clifford W. . Digital photogrammetry : an addendum to the manual of photogrammetry. Bethesda: American Society for Photogrammetry and Remote Sensing, 1996. ISBN 1570830371.

## RESOURCES

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### 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