Course guide
310719 - 310719 - Building Construction Surveys and Layouts

Last modified: 24/01/2024

Unit in charge: Barcelona School of Building Construction
Teaching unit: 752 - RA - Departamento de Representación Arquitectónica.

Degree: BACHELOR'S DEGREE IN ARCHITECTURAL TECHNOLOGY AND BUILDING CONSTRUCTION (Syllabus 2019). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 4.5 **Languages:** Catalan

LECTURER

Coordinating lecturer: JORDI XIQUES TRIQUELL

Others: JORDI XIQUÉS TRIQUELL
JORDI FALGUERAS BOSCH

PRIOR SKILLS

Basic knowledge of planar geometry and graphing systems.

REQUIREMENTS

According to UPC regulations, students aged 28 and over are required to take out private insurance to be able to carry out field internships.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. FE-3 Ability to work with the topographic tools and proceed to the graphical survey of plots and buildings, and its setting in the plot.

Transversal:
2. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.

TEACHING METHODOLOGY

The directed learning hours consist of theoretical classes in which the teacher gives a brief presentation to introduce the general learning objectives related to the basic concepts of the subject. Subsequently and through practical exercises, they try to motivate and involve students to actively participate in their learning.

Support material is used through ATENEA: learning objectives by content, concepts, examples, programming of evaluation and directed learning activities and bibliography.
There are also problem solving classes (medium group) in which work is done by solving exercises or numerical problems related to the specific learning objectives of each of the contents of the subject.

During these problem solving sessions the objective is to incorporate some generic competences, like teamwork.

The last type of directed learning hours consist on doing two fieldwork activities which allow to develop basic abilities in the use of topographic tools like the total station and the spirit level, as well as the main topographic layout works.

After each session, tasks are proposed outside the classroom, to be worked on either individually or in groups.

Autonomous self-learning hours also have to be considered, hours like the ones dedicated to the guided readings, the resolution of the proposed problems and the self-learning questionnaires of the different contents by virtual campus ATENEA.

LEARNING OBJECTIVES OF THE SUBJECT

At the end of the course, the students should be able to:

Be able to use the studied topographic tools with the enough agility, to execute topographic surveys with layouts and geometric control in the construction.

To do the most common office work in topography (for example: radiations and itineraries, areas and coordinates calculation, alignment conditions, longitudinal and perpendicular profiles, cubing of the earth moving)

Generic competence: Teamwork.

The fieldwork practices included in the activities 3 and 6 consist of two parts:

In the first part, the students in small groups , do the field inspections, distributing the different tasks of the work. The team decides the specific work of each one of the members, considering that the addition of the individual tasks affect the quality of the final result.

In the second part, the students write a dossier where they put together and process the data taken in the field.
In the writing of the dossier, the students apply the previous theoretical knowledge teached at class for the different contents.

Evaluation of the competence:

The students fill out individually a questionnaire about their involvement and participation in the two parts of the fieldwork practices, as well as the rest of the members of the team.

STUDY LOAD

Type	Hours	Percentage
Self study	67,5	60.00
Hours small group	18,0	16.00
Hours large group	27,0	24.00

Total learning time: 112.5 h

CONTENTS

C1 INTRODUCTION.

Description:
Surveying, topography and geodesy.
Map and plan. Spreading limit of the topographic plan.
Numeric and graphic scales. LPV.
Angular measurement units.

Specific objectives:
At the end of this content the student must have understood the necessity of topography in the construction process, the difference between a plan and a map, to apply with agility the scale mechanics and draw any graphic scale.
Ability to turn radians and sexagesimal angles into centesimal angles.

Related activities:
Resolution of exercises of the corresponding contents.

Full-or-part-time: 3h 30m
Theory classes: 1h
Practical classes: 1h
Self study : 1h 30m

C2 TOPOGRAPHIC TOOLS.

Description:
TOPOGRAPHIC TOOLS. STADIAMETRIC RANGEFINDING.
Simple topographic tools.
Indirect distance measuring.
Tachymeter.

PLANIMETRICS.
Horizontal or reduced distance.
Horizontal or reduced area.
Topographic setting of a point.
Cartesian and polar coordinate system.
Bipolar coordinate system.
Direct distance measuring.

Specific objectives:
To distinguish between the concepts of planimetrics, hypsometry and tachymetry.
Knowledge of the most simple topographic tools.
Foundations of the level staff.
Use of the tachymeter for the distance and angles measuring.
To understand the concept of horizontal distance and area.
The student must get used to work with the different coordinate systems.

Related activities:
Resolution of exercises of the corresponding contents.

Full-or-part-time: 6h
Theory classes: 1h
Practical classes: 2h
Self study : 3h

C3 TOPOGRAPHIC METHODS. RADIATION

Description:
TOPOGRAPHIC METHODS. RADIATION.
Moinot's direct connection.
Graphic transport of stations and error transmission.
Topographic survey with the radiation method.

HYPSOMETRY
Level, height, altitude and slope areas.
Trigonometric levelling.
- Radiation.
- Closed itinerary.
- Embodied itinerary.
Tolerances. Closing error.

Specific objectives:
Field data obtention with the tachymeter.
Calculation of the tachymetric notebook with the obtained data.
Graphic representation of the calculated points by polar and Cartesian coordinate systems.

Calculation of slopes and heights in the tachymetric notebook.
Verification of the closing error and compensation, if necessary.

Related activities:
Resolution of exercises of the corresponding contents.

Full-or-part-time: 6h
Theory classes: 1h
Practical classes: 2h
Self study : 3h

C4 GEOMETRIC NIVELATION. ENCLOSED SYSTEM . INTERPOLATION LEVEL CURVES.

Description:
GOEMETRIC LEVELLING.
Dumpy level.
Simple levelling.
Double levelling.
Radiation.
Closed itinerary.
Embodied itinerary.
Tolerances. Closing error.

ENCLOSED SYSTEM. LEVEL CURVES INTERPOLATION.
Cylindrical equal-area porjection.
Straight line gradation.
Interval concept.
Equidistance concept.
Interpolation of level curves concept.
Level curves features.

Specific objectives:
Field data obtention with a dumpy level.
Calculation of a geometric levelling table.
Closing error calculation and compensation.

From a data cloud (x,y,z) make the interpolation of the level curves with the required equidistance.

Related activities:
Resolution of exercises of the corresponding contents.

Full-or-part-time: 6h
Theory classes: 1h
Practical classes: 2h
Self study : 3h

C5 CALCULATION OF AREAS. PARTIONS

Description:
Area calculation methods.
- Triangle breakdown.
- Cartesian coordinate system.
- Polara coordinate system.
- Curvilinear outline areas.

Specific objectives:
To know and apply different methods for the calculation of irregular geometry areas.

Related activities:
Resolution of exercises of the corresponding contents.

Full-or-part-time: 6h
Theory classes: 1h
Practical classes: 2h
Self study : 3h

C6 LONGITUDINAL PROFILE.

Description:
- Linear profile of the land drawing.
- The "guitar" of the profile.
- The gradient.
- Calculation of the red heights.

Specific objectives:
Making of a linear profile by a projected axis in the topographic plan.

Related activities:
Resolution of exercises of the corresponding contents.

Full-or-part-time: 6h
Theory classes: 1h
Practical classes: 2h
Self study : 3h

C7 TRANSVERSAL PROFILE. CUBICATION.

Description:
- Components of the crossed profiles.
- Drawing of the profiles.
- Type section.
- Cubage table.

Other cubage methods.
- With horizontal sections.
- With orthogonal reticles.

Specific objectives:
Making of crossed profiles and calculation of the cubage of the earth movements.
Application of other cubage methods.

Related activities:
Resolution of exercises of the corresponding contents.

Full-or-part-time: 6h
Theory classes: 1h
Practical classes: 2h
Self study : 3h

C8 REPLANNING IN BUILDING CONSTRUCTION

Description:
Straight alignment remap.
- Lengthen an alignment.
- Parallel alignment remap.
- Perpendicular alignment remap.

Construction surveying
- Trench surveying.
- Foundations surveying.
- Slope surveying.

Horizontal circular connection curves remap.
- Elements of the circular curve.
- Rod and arrow method.

Specific objectives:
Introduce to the student the main construction surveying tasks.

Related activities:
Resolution of execises of the corresponding contents.

Full-or-part-time: 4h
Theory classes: 1h
Self study : 3h

ACTIVITIES

ACTIVITY 1 DIRECTED 1

Description:
Students will solve a preparatory exercise for the first partial, with notes and consulting the teachers.

Delivery:
This activity is evaluable and worths the 5% of the final mark.

Full-or-part-time: 10h 30m
Laboratory classes: 3h
Self study: 7h 30m

ACTIVITY 2 EXAM PARTIAL 1

Description:
An exercise related with the explained and worked contents will be solved.

Specific objectives:
The corresponding to the studied contents.

Delivery:
This activity is evaluable and worths the 30% of the final mark.

Full-or-part-time: 3h
Theory classes: 3h

ACTIVITY 3 FIELD PRACTICE 1 GEOREFERENCED SURVEY OF A LAND

Description:
Half of the students will do the fieldwork practice and the other half will solve a proposed exercise at class.

Specific objectives:
At the end of the activity, the students should be able to:

. Place correctly the total station.
. Make readings and data gathering.
. Fill in the tachymetric table with the fieldwork data.
. Solve the radiation for obtaining the X,Y coordinates and heights of the surveying points.
. Graphic representation of the surveying zone by graphic convention.

Material:
Fieldwork practice: Total station, tripod, level staff and measuring tape.
Resolution of the exercise: Documentation in Atenea.

Delivery:
This activity is evaluable and has a worth of 15% of the final mark.

Full-or-part-time: 21h
Laboratory classes: 6h
Self study: 15h

ACTIVITY 4 DIRECTED 2

Description:
Students will solve a preparatory exercise for the second partial, with notes and consulting the teachers.

Delivery:
This activity is evaluable and worths the 5% of the final mark.

Full-or-part-time: 10h 30m
Laboratory classes: 3h
Self study: 7h 30m

ACTIVITY 5 PARTIAL EXAM 2

Description:
An exercise related with the explained and worked contents will be solved.

Specific objectives:
The corresponding to the studied contents.

Delivery:
This activity is evaluable and worths the 30% of the final mark.

Full-or-part-time: 3h
Theory classes: 3h

ACTIVITY 6 FIELD PRACTICE 2 LEVEL EQUALTIMETRIC.

Description:
Half of the students will do the fieldwork practice and the other half will solve a proposed exercise at class.

Specific objectives:
At the end of the activity, the student should be able to:

. Place correctly the dumpy level.
. Read correctly the level staff.
. Fill in the levelling table with the fieldwork data.
. To distinguish between itinerary and point radiation.
. To calculate slopes and heights from the obtained data.

Material:
Fieldwork pracice: Dumpy level, tripod, level staff and measuring tape.
Resolution of the exercise: Documentation in Atenea.

Delivery:
This activity is evaluable and worths the 15% of the final mark.

Full-or-part-time: 21h
Laboratory classes: 6h
Self study: 15h

GRADING SYSTEM

The final grade is the sum of the following partial grades from the continuous evaluation:

Final grade = 0.05* Activity 1 (directed 1) + 0.30* Activity 2 (partial 1) + 0.15* Activity 3 (practice Field 1) + 0.05* Activity 4 (directed 2) + 0. 30* Activity 5 (partial 2) + 0.15* Activity 6 (Field 2 practice)

When the final grade is obtained from the sum of grades of the continuous evaluation, there is no reevaluation exam.

EXAMINATION RULES.

If some of the activities is not done, it will be considered as non-marked.

BIBLIOGRAPHY

Basic:
- Muñoz San Emeterio, C. Problemas básicos de topografía planteados y resueltos. Madrid: Ed. Bellisco, 2005.
- Delgado Pascual M. ... [et al.]. Problemas resueltos de topografia. 2a ed. Salamanca: Universidad de Salamanca, 2006.
- Pastrana Agúndez U., Vinuesa Angulo A. Ejecución de nivelaciones, replanteos y mediciones. Valladolid: Ed. Lex Nova, 2005.
- Xiqués Llitjós J. Xiqués Triquell J. Topografia i replantejaments I [on line]. 2a ed. Barcelona: UPC, 1996 [Consultation: 26/09/2014]. Available on: http://hdl.handle.net/2099.3/36313.
- Xiqués Llitjós J. Xiqués Triquell J. Topografia i replantejaments. II [on line]. 3a ed. Barcelona: UPC, 2001 [Consultation: 26/09/2014]. Available on: http://hdl.handle.net/2099.3/36311.

Complementary:
- M.Morejón L. ; Pernaute C. ; Xiqués J. Problemas de topografia. Barcelona: Els autors, 1985.
- Corral Manuel de Villena, Ignacio de. Topografia de obras. Barcelona: UPC, 2001.
- Domínguez García-Tejero, Francisco. Topografía general y aplicada. 13a ed. Madrid: Mundi-Prensa, 1998.

RESOURCES

Other resources:
Cartographic Institute of Catalonia. Publications and Cartography

Web pages
Cartography of the Cartographic Institute of Catalonia. www.icc.cat
Images at Google Earth
Cartography. www.xtec.cat
Sede catastro: sedecatastro.gob.es