Course guide
310016 - 310016 - Building Construction Surveys and Layouts

Last modified: 16/04/2020

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

Degree: **Academic year:** 2020 **ECTS Credits:** 6.0
Languages: Catalan

LECTURER

Coordinating lecturer: JORDI XIQUES TRIQUELL

Others:

PRIOR SKILLS

Basic knowledge of planar geometry and graphing systems.

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 on the one hand in teaching theoretical classes where the professor does a brief exposition for introducing the general learning objectives related with the basic concepts of the subject. Afterwards and by means of practical exercises the professor tries to motivate and involve the students so that they can participate actively in their learning.

It is used support material in detailed educational plan format, by ATENEA. Learning objectives by contents, concepts, examples, evaluation activities and directed learning schedule and bibliography.
There also will be problem classes (medium group) where the students work, by means of the resolution of exercises or numerical problems, related with the specific learning objectives of each content of the subject.

During these exercises sessions it is pretended to incorporate some generic competences, like teamwork.

The last directed learning hours consist on do 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 out of class works will be proposed, individually or in groups.

There also have to be considered the rest of the autonomous self-learning 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:

Ability to use the studied topographic tools with the sufficient agility, for executing topographic surveys with layouts and geometric control in the construction.

To do the most common office work in topography like: radiations and itineraries, areas and coordinates calculation, alignment conditions, longitudinal and perpendicular profiles, and cubing of the earthmoving.

Generic competence: Teamwork.

The fieldwork practices included in the activities 1 and 3 are divided two parts:

In the first part, the students in groups of 6 members, 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, in groups of 3, 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
Hours medium group	15,0	10.00
Self study	90,0	60.00
Hours large group	30,0	20.00
Hours small group	15,0	10.00

Total learning time: 150 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 known the necessity of the 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: 12h
Theory classes: 4h
Self study : 8h

C2 TOPOGRAPHIC INSTRUMENTS.

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: 12h
Theory classes: 4h
Self study : 8h

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.
Realization of the activity 1.

Full-or-part-time: 16h
Theory classes: 6h
Practical classes: 2h
Self study : 8h

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.
Resolution of the activity 3.

Full-or-part-time: 12h
Theory classes: 4h
Self study : 8h

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: 12h
Theory classes: 4h
Self study : 8h

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: 12h
Theory classes: 4h
Self study : 8h

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: 12h
Theory classes: 4h
Self study : 8h

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: 12h
Theory classes: 4h
Self study : 8h

ACTIVITY 1

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

Specific objectives:
Place correctly the tachymeter.
Read correctly the angles and the level staff.
Fill in the tachymetric table with the field data.
Solve the radiation for obtaining the coordinates X,Y and the heights of the points.
To do the basic operations of remaping of the straight alignments.

Related activities:
Make a group dossier with the field data.

Full-or-part-time: 18h
Practical classes: 8h
Self study : 10h

ACTIVITY 2 EXAM.

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

Specific objectives:
The corresponding to the explained contents.

Full-or-part-time: 4h
Theory classes: 4h

ACTIVITY 3

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

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

Related activities:
Make a group dossier from the field data.

Full-or-part-time: 18h
Practical classes: 8h
Self study : 10h

ACTIVITY 4 EXAM

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

Specific objectives:
The corresponding to the studied contents.

Full-or-part-time: 4h
Theory classes: 4h

ACTIVITIES

A1 FIELD PRACTICE TACHYMETER : RADIATION AND REPLANNING.

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.
. Graphic representation of the façade of a building 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 10% of the final mark.

Full-or-part-time: 23h
Practical classes: 4h
Laboratory classes: 4h
Guided activities: 3h
Self study: 12h

A2 EXAM

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: 4h
Theory classes: 4h

A3 FIELD PRACTICE: 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 10% of the final mark.

Full-or-part-time: 19h
Practical classes: 4h
Laboratory classes: 4h
Guided activities: 3h
Self study: 8h

A4 EXAM

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 50% of the final mark.

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

GRADING SYSTEM

The final mark is the addition of these partial marks:

Final mark = 0.10 * Activity 1 mark + 0.30 * Activity 2 mark + 0.10 * Activity 3 mark + 0.50 * Final exam mark.

Final exam: Resolution of some exercises about concepts associated to the learning objectives of the subject.

Activity 1: It will be done during the 4th and 5th school weeks. (The weather conditions could change the realization dates of this activity).

Activity 2: It will be done during the 8th school week.

Activity 3: It will be done during the 12th and 13th school weeks. (The weather conditions could change the realization dates of this activity).

Activity 4: It will be done during the fixed schhol schedule dates.

EXAMINATION RULES.

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

BIBLIOGRAPHY

Basic:
- 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.
- Pastrana Agúndez U., Vinuesa Angulo A. Ejecución de nivelaciones, replanteos y mediciones. Valladolid: Ed. Lex Nova, 2005.
- 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.

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