

Course Unit	Construction Surveying	Field of study	Roads
Bachelor in	Civil Engineering	School	School of Technology and Management
Academic Year	2025/2026	Year of study	1
Type	Semestral	Semester	2
Level	1-1	ECTS credits	6.0
Code	9089-849-1205-00-25		
Workload (hours)	162	Contact hours	T 30 TP 26 PL - TC 4 S - E - OT - O -

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s) Manuel Joaquim da Costa Minhoto

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:

1. analyze the ground surface geometry based on its planimetry and altimetry, by using different methodologies of cartographic representation;
2. Measure distances, areas and volumes from topographical maps, by use numerical methods and appropriate instrumentation;
3. Recognize the basic forms of the land and apply the concept of river basin, being able to perform its delimitation;
4. Represent large areas of land and know how to use the methods of planimetric survey towards the determination of coordinates of land points;
5. Know instruments and accessories needed for the measurement of distances, azimuth angles, zenith angles and heights on the ground;
6. Represent the terrain as a result of topographic survey, with use of appropriate software;
7. Understand the transposition of information from a project, or cartographic representation, into the field, through marking on the ground the references of that projects;
8. Interpret topographic elements from aerial photogrammetry and GPS information.

Prerequisites

Before the course unit the learner is expected to be able to:

1. Know general concepts of design - descriptive geometry;
2. Use appropriate tools to the practice of technical drawing;
3. Use the software for graphics - CAD;
4. Know the mathematical concepts of trigonometry.

Course contents

Methodologies of representation of the land. Analysis and processing of information from the mapping. Planimetric representation of land surface. Surveying. Photogrammetry and GPS.

Course contents (extended version)

1. Methodologies of representation of the land.
 - Basic mapping, geodesy and cartography, reference systems.
 - Scale and methodologies of representation of the land.
 - Obtaining point elevations on a contour representation.
 - Determination of contour lines based on a representation of elevation points.
2. Analysis and processing of information from the mapping.
 - Evaluation of distances in the map by conventional methods and with the curvimeter.
 - Definition of waterbasin and its determination.
 - Assessment of areas in the map by analytical methods, geometric methods and the planimeter.
 - Evaluation of volumes of soil from the map representing the land.
3. Planimetric representation of land.
 - Surveying of large areas - methods of planimetric surveying.
 - Fundamental problems in rectangular coordinates.
 - Different systems of determining points - intersections, triangulations and polygons.
4. Surveying.
 - Instruments and accessories for the measurement of distances, angles and heights on the field.
 - Study of Implementation of altimetric operations in the field - leveling.
 - Study of execution of planimetric and altimetric operations on the field with digital stations.
5. Photogrammetry and GPS.
 - Visualization and interpretation of aerial photography.
 - Study about Topographic operations based on the use of GPS.

Recommended reading

1. Sebenta de Topografia da ESTiG.
2. Topografia geral, A. C. Xerez, I. S. T.
3. Topografia geral, João Casaca, João Matos, Miguel Baio, Lidel.
4. Topografía, geodesia y cartografía aplicadas a la ingeniería, Francisco Javier Polidura Fernández, Mundi-Prensa.
5. Gonçalves, João A. ; Madeira, Sérgio; Sousa, J. João. Topografia - Conceitos e aplicações. Coleções geomática. LIDEL-edições

Teaching and learning methods

Lectures and practical exercises with the study about implementation of topographic operations on field, in order to contact with the methods of representation of the land. Presentation and description of the equipments and description of the execution of altimetric and planimetric surveys and later with graphical representation of the results of these surveys.

Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final)
 - Intermediate Written Test - 50% (Theoretical part - 6 points; Practical part: 14 points)
 - Final Written Exam - 50% (Theoretical part - 6 points; Practical part: 14 points)
2. Alternative 2 - (Regular, Student Worker) (Supplementary, Special)
 - Final Written Exam - 100% (Theoretical part - 6 points; Practical part: 14 points)

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation

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18-02-2026	23-02-2026	08-03-2026	09-03-2026