

Code: ICAR/06

Credits: 9

Matter: Engineering Surveying

Main language of instruction: Italian

Other language of instruction: English

Teaching Staff

Head instructor

Prof. Francesca Giannone - francesca.giannone@unicusano.it

Introduction

1. Objective of the course:

The course "Engineering Surveying" aims to give students a good knowledge of cartography and illustrates the main aspects of metric surveying. It therefore illustrates the essential concepts of geodesy and cartography, the operating principles and the quantities that can be measured with the main topographic instruments, both terrestrial and satellite, and the fundamental statistical concepts necessary for the analysis of topographic observations.

The students will have to: acquire basic knowledge of geodesy that will be declined in the study of cartographic products; understand the basic concepts of tools and techniques of terrestrial and satellite survey, the processing of topographic measurements and the analysis of the results obtained.

Objectives

2. Course Structure:

The course is organized in five module. The first module is focused on geodesy, defining the features of main reference surfaces (as geoid and ellipsoid) and the geodetic reference systems (DATUM) used in Italian cartography.

The second module is focused on cartographic representation, in particular on the Gauss projection. In third and fourth module the topographic instruments are presented, underlining the main features and the setting up. Finally the fifth module is dedicated to the analysis of topographic observations.

The knowledge acquired in theory lessons will be applied in the "virtual classroom" forum through two activities (E-tivity). The skills needed to extract information from

technical cartography (E-tivity 1) and to elaborate simple topographic surveys performed with total station (E-tivity 2) will be developed.

Competencies:

- knowledge of main concept of geodesy.
- knowledge and use of national technical cartography.
- knowledge of classical topographic instrument.
- knowledge of main concept of Global Navigation Satellite System.
- knowledge of the technique for statistical analysis of topographic results.
- ability to use scientific terminology related to cartography and topography.

Syllabus

3. Programme of the course:

Subject 1. Geodesy

Proposed topics: Reference surfaces: geoid, ellipsoid, geodetic and topographic field. Orthometric height, ellipsoidal height and geoid-ellipsoid separation. Geodetic coordinates and Cartesian geocentric coordinates. Local (Datum Roma40, ED50) and global (Datum WGS84) geodetic reference systems. Local reference systems. Transformations between reference systems (2D). Coordinates transformations: from geodetic to cartesian coordinates; from geocentric to local coordinates

Subject 2. Cartography

Proposed topics: types of cartographic representation. Linear, angular and surface deformation coefficients. Gauss representation, azimuth of a geodetic, the whole circle bearing - WCB, the grid convergence the correction angle to the chord. Gauss-Boaga, UTM-WGS84, UTM-ED50 cartographic systems.

Subject 3. Classical surveying tools

Proposed topics: theodolite: general description; setting up of the instrument; The two positions of the theodolite: Face Left - FL and Face Right -FR

Levelling: general description of the instrument; conventional differential levelling, reciprocal and asymmetrical levelling.

EDM - Electronic Distance Measurements: general description of the instrument; measurement methods.

The total station: general description of the instrument

Topographic survey: national geodetic network, intersection, resection, traversing (link traverse, polygonal traverse)

Subject 4. Satellite positioning system

Proposed topics: The global positioning system GPS. Principles of positioning. The structure of the signal. Phase and pseudorange measurements. Absolute and

relative positioning. Static and kinematic positioning modes. Structure of the RINEX file. Introduction of GLONASS and GALILEO positioning systems

Evaluation system and criteria

The exam consists of a written test and two E-tivities carried out during the course in virtual classes.

The written test normally includes 1-2 numerical exercises and 1 theoretical question on the main topics covered in the course.

During the written test, it is NOT allowed to use handouts, notes, texts or forms.

E-tivities are evaluated from 0 to 5 points, while 0-25 points are assigned at the written test.

Bibliography and resources

4. Materials to consult:

The educational materials (lecture notes, slides and video lessons) are available on the unicusano platform.

5. Recommended bibliography:

W Schofield, M. Breach, "Engineering Surveying", Butterworth-Heinemann (Elsevier)