

## 385SM TOPOGRAPHY AND CARTOGRAPHY

### Aims

Acquire knowledge and practical competences relative to cartography, classical and satellite surveying techniques, laser scanning and photogrammetric technologies.

### Contents

Geodesy: reference systems, ellipsoid and geoid, coordinate systems, transformations between reference systems.

Cartography: principal cartographic representations, altazimuthal, conic, cylindrical. Deformation modules.

Gnomonic representation, simple and two parallel conic representation. Sanson-Flamsteed Projection, Polar Stereographic Projection (UPS), Cassini-Soldner, Gauss-Boaga, Mercator and U.T.M. projections.

Italian official cartography (IGM maps, C.T.R.N. Technical Numeric Regional Cartography, Cadaster maps, Müller Cartography of Trieste). Transformation between reference systems.

Digital data source: classic topographic instruments (mechanical theodolites and electronic integrated theodolites, EDM, digital levels).

Plano-altimetric surveys. Planimetric networks. Levelling: tachymetric levelling, geometric levelling, trigonometric levelling. Associated precision.

GNSS: spatial, control and user segments; stand-alone and differential positioning; pseudorange and phase measurements; measurement techniques: static and kinematic surveying (OTF and RTK) and DGPS (RTCM).

Applications of GNSS to civil and environmental engineering and terrestrial, maritime and aerial navigation. EGNOS (European Geostationary Overlay Navigation System).

Laser scanning: theory and applications.

Errors and data statistical adjustment.

Plano-altimetric networks adjustment - associated statistical parameters.

Photogrammetry: photogrammetric cameras. Internal and external orientation parameters. Relative parameters. Collinearity equations. Stereo-models. Photogrammetric restitutions. Digital photogrammetry from drones.

Practical lessons: cartography, transformations between reference systems, classical theodolites, total stations, mechanical and digital levels, GNSS instruments, laser scanners, drones.

### Teaching Format

Theoretic lessons in the room, use of Questionnaires and clickers to verify the knowledge/learnings.

Video recorded lessons (on Teams platform); digital material on Moodle, Seminars on innovative applications in the field of Topography and cartography and practical lessons on cartography, total stations, levelling, surveying using classical and satellite positioning systems, drones, laser scanners and photogrammetry.

### Assessment

Thesis on topics related to the course program: digital cartography / topographic surveys / GNSS / GIS / laser scanning. It must be presented to the oral exam.

### **Obiettivi**

Acquisire conoscenze e competenze relative alla cartografia e alle metodologie di rilievo classiche e satellitari, alle tecnologie laser scanning e fotogrammetriche.

### **Metodi didattici**

Lezioni teoriche in aula, uso di questionari e clickers per la verifica dell'apprendimento.

Lezioni videoregistrate dal Docente su piattaforma e-learning Moodle, Seminari su argomenti innovativi relativi al Programma ed esercitazioni pratiche di cartografia e lettura delle carte e in campagna con l'utilizzo di strumentazione topografica classica e satellitare, livelli digitali, TS e laser scanning.

### **Verifica dell'apprendimento**

Tesina su argomenti attinenti al programma del Corso: cartografia digitale/rilievi topografici/GNSS/GIS/laser scanning. Va presentata all'esame orale.

Esame orale.