

UNB Inventory of Industry Collaboration Needs for the 2020–2021 Academic Year

2 July 2020

In an effort to enable students participating remotely across Canada to access practical field experience normally provided at UNB, the Geodesy and Geomatics Engineering Department at University of New Brunswick is seeking expressions of interest from members of the surveying industry to facilitate some practical activities in the upcoming year. This would involve willingness to involve one to four undergraduate students in some or all of the activities outlined below. The involvement need only be for fieldwork. Computation, analysis, and reporting can be done remotely using UNB resources. While we are currently working on plans for longer term remote delivery of our courses, this solicitation only applies to meeting immediate needs for the 2020–2021 academic year.

The intention is to do this in a way that minimally interferes with day to day operations, and to hopefully also build connections and relationships between students and prospective employers. We hope industrial partners will find value in these activities supporting the training of the next generation of surveyors.

Those interested in partnering with us are invited to contact Greg Smith (greg.smith@unb.ca), who is acting as our Industry Liaison. For more information about this initiative, please contact Robert Kingdon (robert.kingdon@unb.ca), our Director of Undergraduate Studies.

Fall Term, 2020

September to December

GGE 1001

Course Description: Introduction to geodesy and geomatics. Plane surveying techniques. Creation of topographic plans from electronic total stations using CAD software. Non-ground-based positioning methods including LiDAR and GPS. Remote sensing imagery. Introductory uncertainty & estimation theory. Applications of Geographic Information Systems. Answering spatial questions using ESRI software.

Task	Instruments
Level loop (< 1 km)	Automatic level (+/- 2.5 mm/km or better), levelling staffs
Closed-loop traverse (3-4 stations)	Construction grade total station (5" or better), tripods, prisms
Small topographic survey (~100 points)	Construction grade total station (5" or better), tripod, pogo, prism

GGE 3042

Course Description: Principles of space geodesy. The celestial sphere, its coordinate systems, and variations in coordinate systems. Time keeping. Satellite based positioning systems, especially the Navstar Global Positioning System (GPS) including observations, development of mathematical models, static and dynamic positioning, error analysis, software structure, and processing considerations. Real Time Kinematic (RTK) GNSS positioning.

Task	Instruments
Collect and analyze computed position data from three sites with different conditions	Any mass-market GNSS receiver, e.g. Garmin GPSmap 78s
Collect and analyze raw GNSS data using double differencing for a static GNSS survey with 2 receivers and 1 active control station	A pair of survey grade GNSS receivers, e.g. Java Triump LS2

GGE 5022

Course Description: Measurements, processing, and analysis in densification surveys. Control surveys for photogrammetry and construction. Introduction to mining and tunnelling surveys, deformation measurements, and analysis, and industrial metrology. Related issues of occupational health and safety and their management.

Task	Instruments
Optical tooling observations to determine misalignment of points or objects from a line	Jig transits or precise levels with micrometers, and optical tooling scales
Triangulation (intersection/resection) survey in area of limited extent (<50 m in extent)	Precise (1" or better) total station, area where multiple precise target stickers can be placed
Simulated laser tracking survey measuring shape of object with robotic total station (instead of laser tracker) and prism	Precise (1" or better) robotic total station, small target (ideally spherically mounted retroreflector, but these are rare)
Perform a simulated underground traverse in an area including setting up under a ceiling point, plumbing in a vertical "shaft" (e.g. stairwell) and steeply inclined lines of sight	Precise (1" or better) total station with diagonal eyepiece, possibly piano wires and weights for shaft plumbing

Winter Term, 2021

January to April

GGE 2012

Course Description: Barometric and trigonometric heighting. Precise levelling. Mechanical distance measurements. Electronic angle and distance measurement, total stations, and reflectorless EDM. Coordinate transformations and positioning by trigonometric sections. Route and construction surveys. Geodetic control surveys: from triangulation to GPS. Digital terrain models. Contouring. Practical use of GPS. Introduction to the design of surveys and specifications. Related issues of occupational health and safety.

Task	Instruments
ISO 17123-3 angular accuracy test (Simplified Procedure)	Total station (2" or better), tripods, prisms or targets
Level testing using 2-peg test	Optical or digital automatic level (+/- 1.5 mm/km or better), levelling staffs
Double-run level loop to Canadian Second Order Class 1 accuracy	Optical or digital automatic level (+/- 1.5 mm/km or better), levelling staffs
Closed loop and link traverses to 1:20,000 or better relative accuracy	Total station (+/- 2" or better), tripods, prisms
Topographic survey using a combination of radiation with total station, including some reflectorless observations if possible, and RTK or RTN	Total station (+/- 2" or better), ideally with reflectorless capabilities, tripod, pogo, prism, GNSS base station and rover suitable for RTK, or rover suitable for RTN and RTN subscription

GGE 2501

Course Description: Introduction to basic principles and current issues in land administration from Canadian and international perspectives. Covers views of land tenure, land management, land information, management, reform of cadastral systems, and coastal zone management. Includes practical exercises reinforcing course topics while building communications and analytical skills.

Task	Instruments
Show students boundary evidence of different kinds	None required

GGE 3022

Course Description: Specifications for surveys. Systematic and random errors, design, processing and analysis of angle, distance, and height difference measurements. Star observations. Issues of occupational health and safety.

Task	Instruments
ISO 17123-3 angular accuracy test (Full Procedure) and Nickerson Test to estimate instrument pointing, reading, centering and levelling accuracy	Precise total stations (1" accuracy or better), tripods, and prisms or targets
EDM calibration on known or unknown baseline	Precise total stations (1" accuracy or better), tripods, and prisms
Testing of levels using 3-peg test and ISO 17123-2 procedure	Optical or digital automatic or tilting precise level (+/- 0.3 mm/km or better), precise invar levelling staffs

End of Winter Term, 2021

Late April to Early May

GGE 2013

Course Description: Two weeks of practical exercises following spring examinations. Management of occupational health safety issues.

Task	Instruments
Place and survey a minimum of 2 GNSS control monuments to FGCC Order C-2-I or better	3 or more survey grade GNSS receivers (5 mm +/- 1 ppm or better)
Perform a traverse survey to densify existing horizontal control (1:20,000 relative accuracy) combined with a levelling survey to densify existing vertical control (Canadian Second Order Class 1 accuracy)	Total station (+/- 2" or better), tripods, prisms Optical or digital automatic level (+/- 1.5 mm/km or better), levelling staffs
Perform a topographic mapping survey including reflectorless total station measurements	Total station (+/- 2" or better), ideally with reflectorless capabilities, tripod, pogo, prism GNSS base station and rover suitable for RTK, or rover suitable for RTN and RTN subscription
Measure the shape of a building using both total station radiation and laser scanning	Total station (+/- 2" or better), ideally with reflectorless capabilities, and laser scanner

GGE 3023

Course Description: Two weeks of practical exercises following spring examinations. Management of occupational health and safety.

Task	Instruments
Control survey combining a 3-dimensional traverse network survey, levelling network survey, and static GNSS network survey	Precise total stations (1" accuracy or better), tripods, and prisms Optical or digital automatic or tilting precise level (+/- 0.3 mm/km or better), precise invar levelling staffs 3 or more survey grade GNSS receivers (5 mm +/- 1 ppm or better)