GNSS CONSTRUCTION SURVEYING

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https://www.topconpositioning.com/support/products/magnet-field

https://www.topconpositioning.com/gnss/gnss-receivers/hiper-vr

This Senior Project takes a dive into the world of cutting-edge surveying technology which will be implemented into Cal Poly's Construction Management 239 Construction Surveying course. It creates a field exercise for student learning that mimics the uses the of Global Navigation Satellite Systems (GNSS) and how they are used in the construction industry. The new includes the use of GNSS receivers, base hubs, field computers, and a Topcon MAGNET Field application. From the research phase to the training/ learning phase to the implementation of the assignment into the course this project embodied the "Learn-By-Doing" philosophy. This project was successful in demonstrating how GNSS base and rover receivers communicate between each other, satellites, and a field computer to survey an area in prep for or during a construction project. Students were able to set up, collect points, and preform distance and area calculations using the Topcon receivers and Topcon MAGNET Field application for field computers. This project was completed in 6 weeks and was able to be rolled out for CM 239 Construction Surveying course's week 10 lab assignment.

Key Words: Surveying, GNSS, Receivers, Topcon, Field Computers, Assignment

CALIFORNIA POLYTECHNIC STATE UNIVERSITY
CONSTRUCTION MANAGEMENT DEPARTMENT

Lab Activity:

1. Your Superintendent want to know the location of the electrical and water boxes in the area depicted above so that they can begin excavation. Using the GNSS Rover, locate each of the Utility Hubs in the Field adjacent to BLDG. 186 using the TOPO feature of the MAGNET Field Computer. (See Figure 1).
2. Your Superintendent needs to know how much land they need to cut away so that the furthest light poll (Light Poll 3) is at the same elevation as Light Pole 1, in order to pave more parking spaces. Using the TOPO feature of the MAGNET Field Computer and rover, collect a point at each of the light poles to calculate the difference in elevations. (See Figure 1)
3. The electrical subcontractor needs to know how much conduit to run from one light poll (Light Poll 2) to another (Light Poll 3). Using the Inverse Function for a point-to-point calculation, located in the Calculations tab on the MAGNET Field Computer and the GNSS Rover collect points and calculate the length between Light Poll 2 and Light Poll 3. (See Figure 1)
4. Your project executives are looking at turning the grass lot adjacent to BLDG. 186 into a parking lot and need to know the area that they would be working with. Collect points around the perimeter of the grass lot, from the inside of the sidewalk, inside of the gravel path and up the dirt path. Once a perimeter is created use the area function located inside the calculate tab on the MAGNET Field Computer to find the area. (See Figure 1) *Hint: Make sure to only select points along the perimeter*
5. The University wants to update the gravel paved path cutting through the grass lot next to Bldg. 186 and turn it into a 5" concrete sidewalk and 4" gravel fill. The new path will run from Light Pole 3 until it meets the road. (See Figure 2) *Hint: Make sure to only select points along the perimeter*
   a. Using the GNSS Rover collect points along the path and use the area function to calculate the area of the new slab.
   b. Then assuming the slab is 5" thick, find the volume of concrete needed to complete the job.
   c. Then assuming the gravel fill is 4" thick, find the volume of gravel fill needed to complete the job.
   d. BONUS: How many concrete truck deliveries would it take to complete the slab?

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