

Educating Civil Engineering Students on Modern GNSS Data Collection

Ben Shinabery (USA)

Key words: Curricula; Education; Engineering survey; GNSS/GPS; Positioning; Reference frames; Education, 3D Geodesy, GNSS, Static, RTK, Academic Learning, Field Data Acquisition

SUMMARY

Responding to a new epoch of geodetic reference systems, global climate conditions, sustainability requirements, and innovative survey data collection methods, surveyors should anticipate the need for full 3D geodetic field data acquisition. Because we live in a 3D world that connects all together on the global scale, we need to prepare the next generation of surveyors to start every project on geodetic coordinates. The practical modern solution to align every project globally is our GNSS network. Students need to understand the academic theory behind satellite technology, but they also must master the practical skills of establishing control and collecting redundant observations for confidence in the global position.

In the fall of 2024, Ben Shinabery introduced the practical use of GNSS into the civil engineering curriculum of the ABET accredited University of Kentucky program. Students had learned GPS theory and calculations in previous years but did not have hands-on practical experience in a field data lab environment. Knowing how a system works in theory is different than developing the skills to use equipment in their hands. The field lab experience brings practical understanding of the environmental constraints and the expectation of precise measurement using different collection methods (VRS, RTK, PPK, DGPS, Autonomous). Beyond the traditional static positions, now UK students are learning field collection with tilt-sensing Trimble r780i rovers with full access to all open satellite constellations for the most robust positioning solutions on the planet.

By putting GNSS into the hands of modern students, we give them the perspective of collecting precise geodetic data in a fast, robust, accurate manner that will translate to confident, efficient project surveys reducing costs, time and scope of work in this modern world.

Course

Educating Civil Engineering Students on Modern GNSS Data Collection (13617)
Ben Shinabery (USA)

FIG Congress 2026
The Future We Want - The SDGs and Beyond
Cape Town, South Africa, 24–29 May 2026

Objectives:

- 1) Learning how the University of Kentucky gained access to modern GNSS equipment
- 2) Learning how to balance education methods between theory and practical experience
- 3) Learning how new GNSS collection methods are more precise and reliable than traverse with total station and differential levels for new students learning the survey profession