

Course Number and Title: CET 245 Advanced Surveying Co-op

Campus Location:

Georgetown, Stanton

Effective Date:

2022-51

Prerequisite:

ENG 102, (MAT 180 or MAT 183 or higher), (CET 125 or GIS 120), GIS 101, CET 144

Co-Requisites:

none

Course Credits and Hours:

3.00 credits

2.00 lecture hours/week

2.00 lab hours/week

Course Description:

In this cooperative educational work experience, students develop technical skills in the methods and computations of advanced surveying. Surveying techniques based on total stations with data collectors, the Global Position System (GPS) in static and/or kinematic data collection and computers are explored. Additional topics include the global navigation satellite systems (GNSS), data quality, geodesy, geodetic reductions and emerging geospatial technologies.

Required Text(s):

Obtain current textbook information by viewing the [campus bookstore - https://www.dtcc.edu/bookstores](https://www.dtcc.edu/bookstores) online or visit a campus bookstore. Check your course schedule for the course number and section.

Additional Materials:

None

Schedule Type:

Classroom Course

Disclaimer:

None

Core Course Performance Objectives (CCPOs):

1. Apply knowledge and skills previously learned in the classroom to a land surveying or geospatial work experience. (CCC 1, 2, 3, 4; PGC: SET 4, 5, 6)
2. Discuss the governing principles of global navigation satellite systems (GNSS). (CCC 1, 2, 6; PGC: SET 1, 5)
3. Apply the theory of static and kinematic GPS. (CCC 1, 2; PGC: SET 1, 5, 6)
4. Apply the theory of control surveys and geodetic reductions. (CCC 1, 2, 6; PGC: SET 1, 4, 5, 6)
5. Apply the State Plane Coordinate System to survey data. (CCC 1, 2, 6; PGC: SET 1, 4, 5, 6)
6. Develop a strategy to stay current with emerging trends in the field. (CCC 1, 4, 5; PGC: SET 1, 5, 6)
7. Demonstrate professional and ethical conduct as expected in industry. (CCC 1, 2, 3, 4, 6; PGC: SET 1, 6)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

Measurable Performance Objectives (MPOs):

Upon completion of this course, the student will:

1. Apply knowledge and skills previously learned in the classroom to a land surveying or geospatial work experience.
 1. Set goals to be accomplished during the work experience.
 2. Demonstrate previously learned competencies at an introductory level.
 3. Practice using software and equipment necessary to perform all assigned tasks.
 4. Assist supervisor/mentor with assigned tasks.
2. Discuss the governing principles of global navigation satellite systems (GNSS).
 1. Explain the key components of a GNSS system and the functions of each.
 2. Explain the different GPS signals.
 3. Differentiate the satellite reference systems.
 4. Evaluate GPS data quality issues such as multipath, dilution of precision, and signal to noise ratio.
 5. Outline common practices for removing standard sources of error, such as increased observation time, double differencing and post-processing.
3. Apply the theory of static and kinematic GPS.
 1. Discuss the basics of planning a static GPS survey.
 2. Recognize the role of NGS control.
 3. Explain Continuously Operating Reference Stations (CORS).
 4. Compare the uses of real-time kinematic GPS and Differential GPS.
 5. Compare and contrast GPS data post-processing and real-time processing.
4. Apply the theory of control surveys and geodetic reductions.
 1. Identify fundamentals of geodesy, including ellipsoid, geoid, datums and coordinates..
 2. Differentiate between a topographical surface, ellipsoid and geoid in regard to their role in position and height.
 3. Differentiate between astronomic, geodetic and geocentric coordinates.
 4. Differentiate between common vertical, horizontal and gravimetric datums, including historic, current and future.
 5. Describe the National Spatial Reference System.
 6. Determine the geodetic position and ellipsoid radius of curvature.
 7. Apply geodetic references both vertically and horizontally.
 8. Convert point coordinates between historic and current vertical datums.
5. Apply the State Plane Coordinate System to survey data.
 1. Identify the State Plane Coordinate System and associated datums.
 2. Define map projections used in the State Plane Coordinate System.
 3. Convert point coordinates between historic and current horizontal datums.
6. Develop a strategy to stay current with emerging trends in the field.
 1. Identify emerging trends in surveying and geospatial technology.
 2. Discuss technology trends such as GPS, 3D laser scanning, LiDAR, and remote sensing and how they relate to geospatial/geomatic technology.
 3. Identify the potential of new, evolving technologies to meet surveying related needs.
 4. Identify resources such as articles, conferences, and networking opportunities to keep abreast of emerging trends.
 5. Evaluate career options and explain the educational requirements for various land surveying, geospatial and emerging technologies career paths.
7. Demonstrate professional and ethical conduct as expected in industry.
 1. Demonstrate awareness of an employer's specific expectations.
 2. Follow employer's rules for proper attire.
 3. Exhibit punctuality and dependability.
 4. Identify the need for self-discipline and time management in technical industries.
 5. Communicate and function effectively as a member of a team.
 6. Apply professional and ethical responsibilities as expected in industry.

Evaluation Criteria/Policies:

The grade will be determined using the Delaware Tech grading system:

90	-	100	=	A
80	-	89	=	B
70	-	79	=	C
0	-	69	=	F

Students should refer to the [Student Handbook - https://www.dtcc.edu/handbook](https://www.dtcc.edu/handbook) for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

Final Course Grade:

Calculated using the following weighted average

Evaluation Measure	Percentage of final grade
Summative: Experience Journal	30%
Summative: Employee Survey	10%
Summative: Final Exam	30%
Summative: Emerging Technologies Research Project	10%
Formative: Assessments (assignments, homework, participation)	20 %
TOTAL	100%

Core Curriculum Competencies (CCCs are the competencies every graduate will develop):

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):**CETAASSET:**

1. Apply the knowledge, techniques, skills, and applicable tools of the discipline to engineering and surveying activities, including but not limited to site development, hydraulics and hydrology, grading, and structural systems.
2. Conduct standardized field and laboratory testing on civil engineering project materials.
3. Select appropriate materials and estimate material quantities for technical projects.
4. Use graphic techniques and productivity software to produce engineering documents.
5. Integrate appropriate surveying methods for land measurement and/or construction layout and the acquisition of spatial data in accordance with the laws and regulations pertaining to Professional Land Surveying.
6. Demonstrate a commitment to quality, timeliness, professional development, and continuous improvement.

Disabilities Support Statement:

The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the [disabilities services - https://www.dtcc.edu/disabilitysupport](https://www.dtcc.edu/disabilitysupport) web page or visit the campus Advising Center.