

CNST-2520: AERIAL SURVEYING

Cuyahoga Community College

Viewing: CNST-2520 : Aerial Surveying

Board of Trustees:

December 2023

Academic Term:

Fall 2024

Subject Code

CNST - Construction Engineering Tech

Course Number:

2520

Title:

Aerial Surveying

Catalog Description:

Introduction to the methods and procedures of aerial surveying using Unmanned Aircraft Systems (UAS) and its associated applications as it relates to land surveying and mapping. Processing collected data will be done using AutoDesk and/or ESRI software packages.

Credit Hour(s):

3

Lecture Hour(s):

2

Lab Hour(s):

2

Requisites

Prerequisite and Corequisite

CNST-2110 Basic Survey Practices; and CNST-2500 Construction Surveying, or CNST-1740 Fundamentals of Geographic Systems; or department approval.

Outcomes

Course Outcome(s):

Process data collected from aerial surveying methods.

Essential Learning Outcome Mapping:

Not Applicable: No Essential Learning Outcomes mapped. This course does not require application-level assignments that demonstrate mastery in any of the Essential Learning Outcomes.

Objective(s):

1. Process imagery data collected, and create a point cloud.
2. Create a surface model from data collected.
3. Create contours lines from data collected, and explain levels of accuracy.
4. Perform acreage calculations from collected data.
5. Perform a visual inspection of a structure using UAS methods.

Course Outcome(s):

Explain different methods for collecting aerial surveying data and the rules/regulations involved.

Essential Learning Outcome Mapping:

Not Applicable: No Essential Learning Outcomes mapped. This course does not require application-level assignments that demonstrate mastery in any of the Essential Learning Outcomes.

Objective(s):

1. Explain Federal Aviation Administration (FAA) rules for flying drones.
 2. Explain different methods that can be used to collect data from aerial methods.
 3. Explain how different atmospheric conditions can impact the quality of data collected in an aerial survey.
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Methods of Evaluation:

1. Exams
2. Quizzes
3. Homework
4. Laboratory Activities

Course Content Outline:

1. Introduction to Small-Format Aerial Photography and Basic Principles of SFAP
 - a. History in 19th and 20th centuries
 - b. Conventional Aerial Photography
 - c. Small-Format Aerial Photography
 - d. Remote Sensing
2. Principles of photogrammetry
 - a. Geometry of Single Photographs
 - b. Geometry of Stereophotographs
 - i. Base-Height Ratio
 - ii. Reconstructing 3D Coordinates
 - iii. Creating and Analyzing Stereomodels
 - iv. Errors and Corrections
3. Lighting and Atmospheric Conditions
 - a. Multiview-Angle Effects
 - b. Bidirectional Reflectance Distribution Function
 - c. Multispectral Effects
 - d. Latitude and Seasonal Conditions, Clouds, Shadows
4. Photographic Composition
 - a. Basic Elements
 - b. Combining Compositional Elements
 - c. Photographs versus Human Vision
5. Cameras for SFAP, Manned and Tethered Platforms and Mounts
 - a. Film and Digital Camera Basics
 - b. Camera Geometry and Light
 - c. Color-Infrared and Multispectral Imagery
 - d. SFAP Cameras for Photogrammetric Applications
6. Unmanned Aerial Systems
 - a. Terminology
 - b. UAS (Unmanned Aerial Systems) Types and Common Characteristics
7. SFAP Survey Planning and Implementation
 - a. Introduction to Airspace
 - b. Site Accessibility and Characteristics
 - c. Ground Control
 - d. Flight Planning
8. Visual Image Interpretation
 - a. Image Interpretability
 - b. Stereoscopic Viewing
9. Digital Image Processing and Analysis
 - a. Geometric Correction and Georeferencing
 - b. Image Enhancement and Transformations
 - c. Image Classification

- i. How classification works
 - ii. How to classify
 - iii. Manual versus automated methods
 - iv. Merging grids and methodologies
 - v. Accuracy
10. SFAP Legal Issues
- a. Regulations in the United States
 - b. Regulations throughout the world
 - c. Insurance
11. Introduction to FAA regulations
- a. 14 CFR Part 107 Small Unmanned Aircraft Systems Introduction
 - b. Airspace
 - c. FAA licensing requirements
 - d. FAA Chart Reading
 - e. Terminology

Resources

Aber, James S., et al. (2019) *Small-Format Aerial Photography and UAS Imagery: Principles, Techniques and Geoscience Applications*, Elsevier.

Ghilani, Charles D. (2021) *Elementary Surveying: An Introduction to Geomatics*, Pearson.

Resources Other

FAA UAS website (2023) <https://www.faa.gov/uas>

FAA Website "Where Can I fly?" (2023) https://www.faa.gov/uas/getting_started/where_can_i_fly

FAA, "Become a Drone Pilot" (2023) https://www.faa.gov/uas/commercial_operators/become_a_drone_pilot

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