

Course: GISC 4328/6328
Drone & Remote Sensing
Terms: Spring, 2025

Meetings: Thursday 4:00-6:45 PM
Location: GR 3.402

Instructor:

- **Dr. Fang Qiu**, Professor and Department Head
- **Phone:** 972-883-4134 | **Email:** ffqiu@utdallas.edu
- **Office Hour:** Wednesday 3 PM -4 PM
- **Office Location:** GR 3.212

Teaching Assistants:

- Hao Chen; Email: Hao.Chen2@utdallas.edu;
- Office Hour: Wednesday 9 AM -11 PM

Class Delivering:

In person: **Students meet at the scheduled class day, time and location.**

- We will also use eLearning for this class. Please contact me through eLearning or MS Teams for all class related issues.

Course Description

- Recent technological advancement and Federal Aviation Administration (FAA) regulation now make it possible for a growing number of individuals and commercial firms to own small unmanned aerial systems (sUAS) - often called **drones**. This offers new opportunities for many business operation and scientific research, including collecting high resolution remotely sensed images, which were traditionally acquired by sensors onboard satellite and manned aircraft platforms. As an alternative remote sensing platform, drone provides a person with a complete control on the type of aircraft used (e.g., fixed-wing or multi-rotor drone), the sensor system (e.g., visible, NIR, and thermal camera), location, time of day, altitude above-ground-level (AGL), look-angle (e.g., oblique, vertical), look-direction, and duration, and at a reasonable cost, which was impossible before. To enable more students to perform personal remote sensing using drone, the class is offered at the graduate level. The course will cover the theories, technologies, methodologies, and application of drone based photography and videography for remote sensing purposes. The course is open not only to GIS students, but any students who are interested in drone technology at UTD.

Course Outcomes:

Upon completing this class, students will be able to

- Understanding principles of drones, remote sensing and photogrammetry
- Becoming familiar with the important technological components of different types of drone, sensors, and knowing how to build a drone yourself.
- Knowing principles of flight mission objectives and mastering mission planning software
- Operating remote controls to fly drones manually or with programmed flight lines through hands-on practice
- Processing drone photography and videography data to form orthomosaics and 3D digital surface models using structure from motion (SFM) software.
- Visualizing 3D models of drone data and performing accuracy assessment
- Performing data analysis to extract features from drone data using GIS and remote sensing software
- **Learning the safety and regulations to fly drones legally and safely, including knowledge required to obtain FAA Part 107 Remote Pilot Certificate**
- **Applying information extracted from drone photography and videography to independently solve various real-world problems.**

Pre-requisites

- **No formal pre-requisites.** Taking GICS 6325 (Remote Sensing Fundamentals) is recommended.

Textbooks

- Jensen, John R., Drone Aerial Photography and Videography: Data Collection and Image Interpretation. Kindle Edition. https://www.amazon.com/Drone-Aerial-Photography-Videography-Interpretation-ebook/dp/B07929YHLS/ref=sr_1_1?keywords=Drone+Aerial+Photography+and+Videography&qid=1552960996&s=gateway&sr=8-1

Tentative Schedule

Week Number	Topics, Reading and Lab Assignment
1	Introduction to the Course (Ch 1) <ul style="list-style-type: none">● Understanding basics of drone and principles of remote sensing and photogrammetry● Lab 0. How to use eLearning
2	Drone Anatomy (Ch2) <ul style="list-style-type: none">● Becoming familiar with the important technological components of different types of drones, sensors, and their applicability.

	<ul style="list-style-type: none"> • Identify parts of drone, potentially build your own drone with available parts. • Lab 1: Drone parts identification, flight site investigation and flying observation.
3	<p>FAA Legal Consideration (Ch3)</p> <ul style="list-style-type: none"> • Learning the safety and regulations to fly drones legally and safely, including knowledge required to obtain FAA Part 107 Remote Pilot Certificate
4	<p>Collect Aerial Photography and Videography (Ch 4)</p> <ul style="list-style-type: none"> • Knowing principles of collecting drone photography and videography and flight mission planning • Remote Pilot
5	<p>Manual Flying</p> <ul style="list-style-type: none"> • Operating remote controls to fly drones manually or with programmed flight lines through hands-on practice. • Lab 2: Manual flying drones (such as DJI Phantom 4, Mavic 2 Enterprise Advanced and Mavic 3 Multispectral) to perform operations such as taking off, moving forward and backward, turning left and right, return home, landing and collecting still images.
6	<p>Mission Planning and Automatic Flying</p> <ul style="list-style-type: none"> • Mastering mission planning software: such as DJI GS, Drone Deploy, and Mission planner • Lab 3: Developing a data collection plan with mission planning software; Automatic Flying and Data Collection with Mission Planning.
7	<p>Interpreting Aerial Photography and Videography (Ch5)</p> <ul style="list-style-type: none"> • Visualizing drone data and performing data analysis to extract features from drone data using GIS and remote sensing software. • Lab 4: Drone image labeling
8	<p>Structure from Motion</p> <ul style="list-style-type: none"> • Processing drone photography and videography data to form orthomosaics and 3D digital surface models <p>Proposal for Final Project Due</p>

9	Spring Break <ul style="list-style-type: none"> No class
10	Midterm Examination <ul style="list-style-type: none"> (AAG Meeting)
11	Orthomosaic and 3D models <ul style="list-style-type: none"> Lab 5: Processing the collected Data using Structure from motion software: such as Drone2Map and ArcGIS Pro software
12	Applications (Ch 6, 8, 9) <ul style="list-style-type: none"> Applying information extracted from drone photography and videography to a specific pilot project, with potential subject areas in 3D modeling, vegetation mapping, and species classification, etc.
13	Research with Drone Remote Sensing (Guest speaker) <ul style="list-style-type: none"> Use thermal image collected by drone to observe wildlife animals, georeferencing images, detect and identify animal types, create animal distribution maps. Lab 6. Animal detection and identification with thermal drone
14	FAA certification (Ch7) <ul style="list-style-type: none"> Summary: Learning to become a FAA Certified Remote Pilot
15	Mock FAA Remote Pilot Exam & working on final project: <ul style="list-style-type: none"> Students work on the final project with a topic of interest they identified.
16	Individual Final Project Presentation <ul style="list-style-type: none"> Present a project using existing data for an application of interest.

Grading Policy

- Pop Quiz (10%), Labs (50%), Midterm Exam (10%), Mock FAA Exam (10%) and Final Project (20%)

Make-up Exams

- No Make-up exam or project will be given without a legitimate reason accompanied by proper documentation (e.g., a doctor's excuse).

Late Work

- Late submission for labs will be penalized 10% per day late.

Class Attendance

- Students are expected to attend and actively participate in class discussion.

Classroom Citizenship

- Please make sure you turn off your cell-phone before coming to the classroom. Viewing anything that is not related to class and communicating with others using instant messenger are prohibited during the class.

Academic Dishonesty

- All suspected cases of academic dishonesty (cheating, plagiarism, collusion, etc.) will be immediately forwarded to the Office of Judicial Affairs. Students have a right to due process through Judicial Affairs, but if the accused student is found guilty of misconduct, Judicial Affairs has sole authority for determining punishment.

UT Dallas Syllabus Policies

- <http://coursebook.utdallas.edu/syllabus-policies/>
- These descriptions and timelines are subject to change at the discretion of the Instructor.