PLS198: UAVs in Agriculture
Spring 2018

Course syllabus

I. Basic information

Lecture: Mon. 11:00-11:50am
Asmundson 242 (Big Hanna)
Laboratory: Wed. 2:10-5:00pm
Parsons 111; PES 1137, Hunt
Instructor: Travis Parker
Contact: trparker@ucdavis.edu
Office hours: By appointment
Instructor-of-record: Paul Gepts
Contact: plgepts@ucdavis.edu

II. Description

Pre-requisite: Consent of instructor

Lecture: 1 hour, laboratory: 3 hours. Applications for unmanned aerial vehicles in agriculture, including federal drone regulations, sensor types, mission planning, image capture, processing, and future directions. No previous drone experience required.

III. Grading

Exam 1:	30%
Final exam:	30%
Final project:	30%
Participation:	10%

Both exams will be one third multiple choice, two thirds short answer. The final will be cumulative. Actual questions released from the FAA's knowledge test will be included in the tests, so study practice tests accordingly.

The final project will be team-based, and will require you to come up with a research question, state your hypotheses, capture the required imagery, and process the results using the software skills you will develop during the course. These will need to be submitted by 5pm on the 6/8, the day of the final.

Standard letter grading will be used. The class can be taken P/NP by taking a copy of the syllabus to the Office of the Registrar and filing a 'Grading Variance Exception' petition by the 25th day of instruction.

Forming a study groups for part 107 certification is strongly encouraged.

IV. Course objectives

By the end of the course, students are expected to be able to:
a. Describe the current range of activities being conducted with UAVs.
b. Compare and contrast the value of the major vehicle and sensor types for aerial imagery acquisition.
c. Discuss the major vegetation indices that can be captured using drones, and describe their relevance for precision agriculture and plant breeding.
d. Learn how to safely operate a UAV, in both manual and programmed flight modes.
e. Understand the legal regulations surrounding UAV use to a level of competency that they could pass the Part 107 Remote PIC exam.
e. Develop flight plans for optimal orthomosaic quality of a given area.
g. Create 2D orthomosaics and 3D models from drone-based imagery.
h. Compare and contrast the use of UAVs in diverse agricultural systems, such as row crops, rangeland, and plant breeding projects.
i. Understand the role of GIS in extracting geospatial data gathered by UAVs.
j. Use UAV-based imagery and models to answer a pertinent research question.
k. Discuss the future of drones and what factors might affect their widespread use.
l. Describe current and future issues surrounding drone use.

V. Meeting locations

Lecture location:

Asmundson 242 (Big Hanna): All dates

Labs will cover a variety of topics, from paper discussions, to flights in the field, to imagery processing in the computer lab. We will therefore meet in several different locations.

Parsons 111: 4/4, 4/11, 4/18, 4/25

Field site: 5/2, 5/9. The main field site will be immediately south of the sheep unit, on the west side of highway 113. This is far removed from buildings, pedestrian traffic, and the university airport, and is very close to a number of row crop fields, orchards, vineyards, and pasture area. If you plan a project in another area for 5/9, please let Travis know at least three days in advance.

Field site:
https://www.google.com/maps/place/38%C2%B031'35.0%22N+121%C2%B046'30.8%22W/@38.5243019,-121.7772296,1274m/data=!3m1!1e3!4m6!3m5!1s0x0:0x0!7e2!8m2!3d38.5263841!4d-121.7752121

Computer labs: The final labs will be in the computer labs. PES 1137 will be the meeting location on 5/16, 5/23, and 5/30. **Hunt 253 will be the meeting location for 6/6.**

VI. Course timeline

Lecture date	Lecture topic	Additional personnel	Lab date	Laboratory topic	Lab location	Additional personnel
4/2	Course overview, the use of UASs in agriculture		4/4	Introduction, dicussion of student's interests, FAA compliance and remote pilot certification (Part 1)	Parsons 111	
4/9	The right tool for the job: Comparison of UAVs with traditional airborne platforms, major UAV classes		4/11	FAA compliance and remote pilot certification (Part 2) and UC drone safety	Parsons 111	
4/16	Sensors and cameras, vegetation indices		4/18	Group assignment, Q and A about sensors, cameras, indices, and certification , paper discussion	Parsons 111	
4/23	Mission planning and imagery processing	Taylor Nelsen	4/25	Prep for final projects and exam, flight simulator	Parsons 111	
4/30	Exam 1		5/2	In-field flight training	Field site	Taylor Nelsen, Emily Hurry?
5/7	UAV applications: Forages (Project plan due)	Grace Liu	5/9	Flight imagery	Field site	Taylor Nelsen, Emily Hurry?
5/14	UAV applications: row crops	Taylor Nelsen	5/16	Orthomosaicking, NDVI, and advanced outputs using Pix4Dmapper	PES 1137	Taylor Nelsen
5/21	UAV applications: Hyperspectral imaging to detect insect pressure	Elvira de Lange	5/23	GIS in UAS research	PES 1137	Alex Mandel
5/28	No lecture, memorial day		5/30	Final projects	PES 1137	
6/4	UAS directions and issues		6/6	Final projects	Hunt 253	
6/8	8-10am: Final exam					