US (AZ): DRONE & PHOTOGRAMMETRY TRAINING FOR ARCHAEOLOGISTS

May 23- June 5, 2027

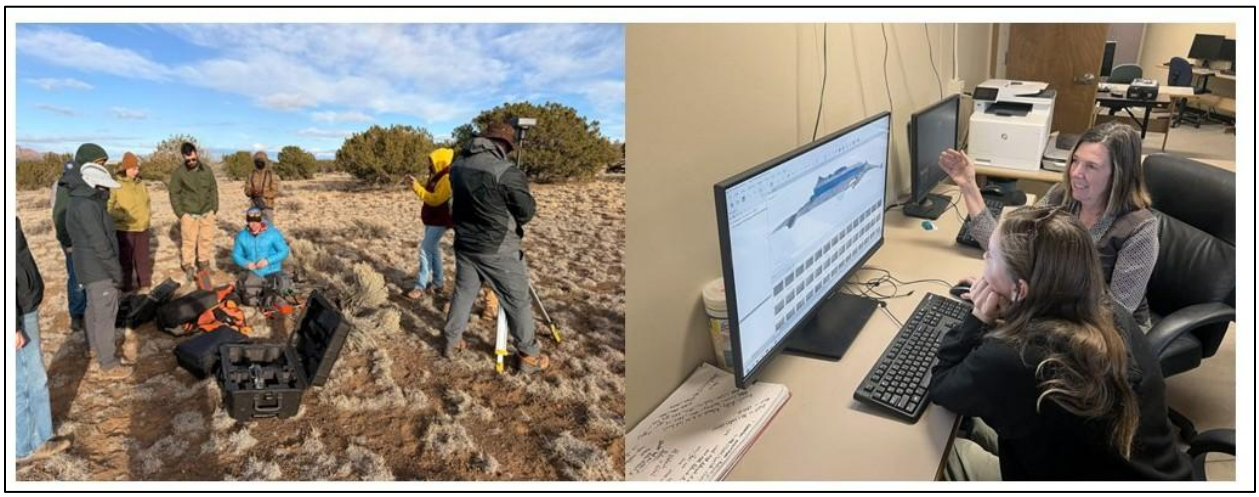
Academic Credits: 4 Semester Credit Units (Equivalent to 8 Quarter Units)

School of Record: Culver Stockton College

This program does not administer or pay for the official FAA Part 107 Certification Exam. We run a practice exam at the end of the program, so students are prepared to pass the official exam.

DIRECTOR:

Dr. Kayeleigh Sharp, RPA, FAA Part 107 Certified sUAS Pilot – Assistant Research Professor, Department of Anthropology; Researcher, Radiant Center for Remote Sensing; Director, Digital Archaeology Lab, Northern Arizona University (kayeleigh.sharp@nau.edu)



INTRODUCTION

Drones are an essential tool in today's archaeological practice, both in academic research and professional archaeology (e.g., Cultural Resource Management or CRM, heritage studies or site damage mitigation). Drones save time and money on archaeological surveys, and they also provide excellent high-resolution spatial information for site detection, monitoring and regional landscape studies. Flying a drone is simple when you know how to do it. In fact, you can learn how to do that in just a few hours. The challenging part is mastering flight maneuvers for managing archaeological surveys, site and environmental monitoring and how to handle emergencies in the air.

During the first week, you will gain hands-on experience, learn about drone safety and practice advanced flight maneuvers. You will also learn how to collect accurate and relevant data for a variety of practical applications in archaeology, from photogrammetric modeling of archaeological

sites to damage mitigation recording. You will also gain clear understanding of the advantages and limitations of different types of drones and sensors and when they are most applicable.

Through daily lectures and hands-on activities, you will develop and apply skills to become a certified Part 107 drone pilot. During the program, you will be introduced to at least three types of drones and their appropriate deployment (recreational drones, mid-sized quad and or hexacopters, Blue Drones, etc.). You will also learn how to use different types of sensors, when and why to use them (RGB, multispectral, GPR, etc).

During the second week, using industry-standard and open-source software, GIS platforms, and analytical tools, you will learn photogrammetric principles, how to create 3D terrain models, the fundamentals of image selection and quality control, the basics of geospatial visualization, and how to create professional-quality deliverables based on data you collect in the field. All of these skills are essential for both CRM compliance and archaeological academic research.

Upon completion, you have the training to successfully complete FAA Part 107 certification exam. You will also have the tools to conduct safe and responsible sUAV fieldwork as a researcher or Cultural Resource Management professional. While this program is designed for archaeologists, professionals conducting paleontological, geological and other landscape surveys may benefit from participating.

IMPORTANT DISCLAIMER

The Anthropocene Research Center was established to support field training in a range of sciences at sites within the U.S. & across the world. Traveling and conducting field work involves risk. Students interested in participating in any ARC program must weigh the potential risk against the value of education provided by the program of their choosing.

Risk is inherent in everything we do, and the ARC takes risks seriously. A committee of leading scholars review each field school location prior to approval. Once a program is accepted, the ARC continually monitors conditions at the program's site and so we can provide an experience that is as safe as possible.

The ARC does not provide trip or travel cancellation insurance. Students are encouraged to explore such insurance policies on their own. Post Covid 19, most basic policies do not cover trip cancelation due to pandemics. If you wish to purchase an insurance policy that covers such contingencies, explore Cancel for Any Reason (CFAR) plans. Insuremytrip.com, Squaremouth.com or Travelguard.com are possible websites where students may explore different insurance policies.

Students should be aware that conditions in the field are different than those experienced at home, dorms or college towns. Students will be exposed to the elements, live in rustic accommodation, and expect to engage in daily physical activity.

We do our best to follow schedule and activities as outlined in this syllabus. Yet local permitting agencies, political, environmental, personal, and/or weather conditions may force changes. This syllabus, therefore, is only a general commitment. Students should allow flexibility and adaptability as research work is frequently subject to modification.

All students must consult medical professionals to ensure they are fit to participate in a ARC field program. ARC is not qualified to provide medical advice. For all other concerns, please consult with ARC staff members or program director(s) – as appropriate.

COURSE OBJECTIVES

In this intensive field school, you will master the technical and regulatory fundamentals, understanding drone advantages and limitations according to updated FAA Part 107 regulations. You will also learn how to carry out safe, non-destructive UAV surveys for specific archaeological and heritage management applications.

This course will take place in Northern Arizona, a little over an hour from the Grand Canyon. During the first week, you will participate in complete bootcamp-style learning activities and into the field to refine hands-on skills. For the final practical exam known (aka the 'Drone AZ Rodeo'), participants will work in aerial survey crews of two-three individuals, rotating among various types of equipment and applying different aerial survey techniques.

During the second week, you will focus on data collection and photogrammetric reconstruction of archaeological sites. You will then learn basics of data processing and analysis using open source tools including WebODM and QGIS. You will also work with industry-standard proprietary tools (i.e., Agisoft Metashape and ArcGIS) to help you make your own budgeting decisions.

LEARNT SKILLS

We are aware and strongly support students who seek employment in the Cultural Resource Management sector – whether with private CRM companies or in government compliance agencies. CRM employers seek to understand the skills students learn at the field school. To that end, we are listing all the skills students will learn during this program. In addition to transferable university credit, students will get a Certificate of Completion, and each skill will be ranked at one of three levels at the end of the field school:

- ✓ **Basic**: Can perform the skill/task with some supervision.
- ✓ **Competent**: Can perform the skill/task without any supervision.
- ✓ **Advanced**: Can perform the skill/task and teach others how to do it.

Students will be trained in the following skills:

Skill	Description
Compliance-Consultation	Ability to understand the interests and conduct consultation with all relevant stake holders, especially those of indigenes communities
Compliance-CRM State Legislation	Understand how to find and comply with individual state legislation, laws and rules concerning cultural and natural heritage
Field-Data Recording	Ability to use printed or digital sheets to document & record field data
Field-Monitoring	Monitor constructions site and identify danger to cultural or natural heritage
Field-Photography	Ability to take clear images of various features, artifact & soil colors at various light and field depth conditions
Field-Project Management	Understand the logistics, time management, product and HR needs of field projects
Software-Image Editing	Ability to display, create & edit images/graphics in graphic software, such as Adobe Illustrator, Photoshop, etc.
Specialty-Photogrammetry	Ability to create and interpret photographic and electromagnetic radiant imagery & patterns
Survey-Drone Survey	Able to fly a drone and design systematic land coverage, documentation & survey
Survey-General Principles	Ability to conduct & document systematic, pedestrian survey using a topographic map -- printed or digital
Survey-Map/Plan Making, Digital	Ability to use digital tools (Total Station, differential GPS, etc.) to create maps and plans of a site

COURSE SCHEDULE

Week 1 (Hat Ranch)

Time	Activity
Sunday 6:00-8:00pm	Arrival Dinner, Meet & Greet
Monday 8:30-4:30pm	Lecture: Welcome and Getting Started with FAA Part 107 Regulations & First Look at Sectional Charts Field: IACRA registration, Equipment Checkout, TRUST Certificate & Basic Flight Maneuvers (BFM)
Tuesday 8:30-4:30pm	Lecture: Environmental Awareness, Safety, Obstacle Detection, Emergency Procedures & Kaibab National Forest (KNF) Overview Field: Crew Coordination, Communication & BFM
Wednesday 8:30-4:30pm	Lecture: Sectional Chart workshop, Airspace & Weather Classification Field: Survey Planning & Archaeological Site Survey
Thursday 1:30-4:30pm	Lecture: Preflight & Airspace Navigation, TFRs & Special Permissions Field: Near-Earth Site Feature Survey & Data Collection for 3D Modeling
Friday 8:30-4:30pm	Field: Complete Preflight Checklist & Drone Rodeo
Asynchronous Exam	Part 107 Practice Exam
Sat-Sun	Days off & Site Tours

Week 2

Time	Activity
Monday 9:00-4:00pm	Lecture: Photogrammetry Basics, From Image Quality to Flight Planing Field & Lab: Mission planning for flat sites
Tuesday 9:00-4:00pm	Lecture: Software Bootcamp (e.g., Agisoft Metashape / WebOMD/QGIS) Field & Lab: Mission planning for features & monumental architecture
Wednesday 9:00-4:00pm	Lecture: Drone Data for GIS, Georeferencing, Layering Field & Lab: Combined techniques for complex sites, data processing & GIS
Thursday 9:00-4:00pm	Lecture: Basic 3D spatial analysis & reporting Field & Lab: 3D Image visualization, analysis & interpretation
Friday 9:00-4:00pm	Morning: Report/presentation finalization, Afternoon: Team presentations
Friday Evening 4:00-6:00pm	Farewell Dinner

** Course schedule may be subject to change upon directors' discretion based on weather conditions or other limiting factors*.

TYPICAL WORKDAY

The first week is dedicated to Part 107 instruction and practical training in the field. From the second week forward, students will follow this daily schedule:

Time	Activity
7:00-8:00am	Coffee & breakfast
8:30am	Lectrue & field activities begin
10:00-10:15am	Morning break
12:00pm-1:00pm	Lunch break
2:00-2:15pm	Afternoon break
4:00-5:00pm	Data download & workday ends
6:00pm	Family-style dinner

** In case of inclement weather days, lectures and lab work will be performed.*

ACADEMIC GRADING MATRIX

Students will be graded based on their work as follows.

40%: Attend and participate in each scheduled day, including lecture, field and laboratory work
20%: Asynchronous Part 107 Practice Exam
20%: Drone Rodeo (BFM exam)
20%: Final Presentation

ATTENDANCE POLICY

The required minimum attendance for the successful completion of the field school is 95% of the course hours. Any significant delay or early departure from an activity will be calculated as an absence from the activity.

An acceptable number of absences for medical or other personal reasons will not be considered if the student catches up on the field school study plan through additional readings, homework, or tutorials with program staff members.

PREREQUISITES

None. This is a hands-on, experiential learning opportunity and students will study on-site how to conduct archaeological research under the direction of a range of specialists in the field. Field work involves physical work and exposure to the elements and thus requires a measure of understanding that this will not be the typical university learning environment. You will have to work outdoors in physically demanding environments, and students must plan ahead for both cold and hot weather conditions. Students are required to come equipped with sufficient excitement and an adequate understanding that fieldwork requires real, hard work, in the sun and wind and perhaps even snowy conditions. The work requires patience, discipline, and attention to detail.

MEALS & ACCOMMODATIONS

Students and staff will stay at the historic Hat Ranch located near Williams AZ. Participants are expected to arrive on Sunday evening for check-in and meet-and-greet. Check out is officially Saturday morning, May 29. This program provides housing and three family-style meals. Rooms are double or single occupancy, depending on availability and course enrollment. Bed and bath linen, and toiletries are not included so bring a sleeping bag and/or blanket, and personal towels.

VISA REQUIREMENTS

This is a domestic program, and no visa is needed for U.S. Citizens.

Non-US Citizens are asked to check the United States embassy website at their home country for specific visa requirements.

TRAVEL & MEETING POINT

We suggest you hold purchasing your airline ticket until six (6) weeks prior to departure date. Natural disasters, political changes, weather conditions and a range of other factors may require the cancelation of a program. The ARC typically takes a close look at local conditions 6-7 weeks prior to program beginning and makes a Go/No Go decision by then. Such time frame still allows for the purchase of competitively priced airline tickets, while protecting students from potential loss of ticket costs if the ARC is forced to cancel this program.

There will be two meeting points for this program:

1. If you fly to Flagstaff Pulliam Airport (FLG), we will meet you at the baggage claims area on

the first day of the program (Sun) at 4:00pm

2. If you drive to the field school, make your way to the Hat Ranch at Williams AZ and arrive on the first day of the program (Sun) by 5:30pm.

If you missed your connection or your travel is delayed, please call, text or email the project director immediately. Local emergency cellular phone contact information will be provided to all enrolled students.

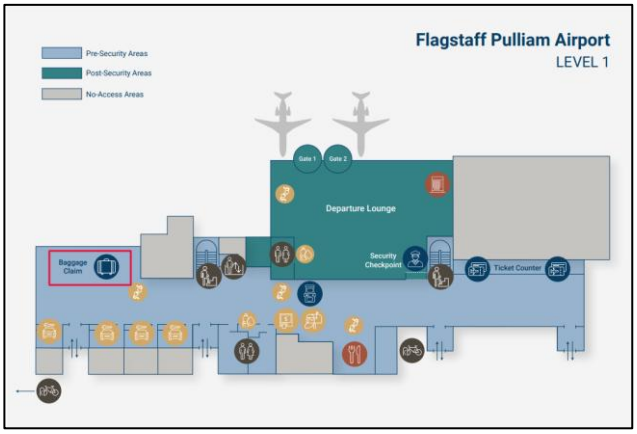


Figure 1: Flagstaff airport plan with meeting area by baggage claim

Figure 2: View of the historic Hut Ranch

PROGRAM ETIQUETTE

Life in the communities in northern Arizona is focused on the outdoors. No excessive or underaged alcohol or controlled substance consumption is allowed at Hat Ranch during the project. We reside on NAU property. Students are expected to obey local laws and are strongly encouraged to observe a 9:00 pm tuck-in time and stay well hydrated in order to start field and lab work early each day.

EQUIPMENT LIST

- A pair of sturdy working shoes (thick-soled sneakers or light-weight hiking shoes) and a comfortable pair of shoes for walking in semi-rugged terrain.
- Clothing suitable for outdoor work: a wide-brimmed hat and sturdy lightweight clothing with long sleeves and long pants (to protect against the equatorial sun, insects, and thorns).
- Comfortable house clothes for relaxing after field work.
- Both lightweight jacket and heavy coat as weather conditions change rapidly in northern Arizona.
- One or two reusable water bottles to pack into the sites.
- Sunscreen & hat.
- A small backpack for your water bottle, snacks, cellular, etc.
- Personal towel, sleeping bag and/or blanket
- A positive attitude towards work, fun, study, and discovery!

PRACTICAL INFORMATION

International dialing code: 001 (if dialing from outside the US)

Money/Banks/Credit Cards: USD$

ATM availability: Many ATM machines are available throughout Flagstaff

Local Language: English

Measure units: degree Fahrenheit (ºF), foot/yard/mile, pound (lb), quart/gallon.

Field units: Meter (m.), Gram (gr.)

Time zone: Local time is Mountain Standard time.

ACADEMIC CREDITS & TRANSCRIPT

Attending students will be awarded 4 semester credit units (equivalent to 6 quarter credit units). Students will receive a letter grade for attending this field school based on the assessment matrix (above). This program provides a minimum of 200 direct instructional hours. Students are encouraged to discuss the transferability of credit units with faculty and the registrar at their home institutions prior to attending this program.

Students will be able to access their transcripts through our School of Record – Culver-Stockton College. C-SC has authorized the National Student Clearinghouse to provide enrollment and degree verification (at https://tsorder.studentclearinghouse.org/school/select). Upon completion of a program, students will get an email from C-SC with a student ID that may be used to retrieve transcripts. The first set of transcripts will be provided at no cost; additional transcripts may require payment. If you have questions about ordering a transcript, contact the C-SC office of the registrar at registrar@culver.edu.

REQUIRED READINGS

Armstrong, Gabriella. "Unmanned Aerial Systems and an Archaeology of Accessibility." *Advances in Archaeological Practice* (2026): 1-14.

Chanev, Milen, Petru Ciocani, Galin Petrov, Pavel Popov, Georgi Jelev, Iskren Ivanov, Zlatomir Dimitrov, Mihaela Tsvetkova, and Lachezar Filchev. "Remote sensing and GIS as non-destructive methods in archaeology." In *Eleventh International Conference on Remote Sensing and Geoinformation of the Environment (RSCy2025)*, vol. 13816, pp. 572-582. SPIE, 2025.

Du, Fengyuan. "Remote Sensing Applications in Cultural Resource Management: Comparative Insights from Sentinel-2 Imagery and UAV-based 3D Modelling." In *2026 11th International Conference on Social Sciences and Economic Development (ICSSED 2026)*, pp. 783-792. Atlantis Press, 2026.

Kaimaris, Dimitris. "Aerial Remote Sensing for Precision Archaeology Using RGB–Multispectral Image Fusion of UAS Data." *Drones and Autonomous Vehicles* 3, no. 2 (2026): 10009.

RECOMMENDED CASE STUDIES

Abate, Nicodemo, Dimitris Roubis, Anthi Aggeli, Maria Sileo, Antonio Minervino Amodio, Valentino Vitale, Alessia Frisetti et al. "An open-source machine learning–based methodological approach for processing high-resolution UAS LiDAR data in archaeological contexts: a case study from Epirus, Greece." *Journal of archaeological method and theory* 32, no. 2 (2025): 38.

Anderson, R. Scott, Damara Kautz Strong, and Paul Whitefield. “Late Holocene Palaeoenvironments within Northern Arizona’s Wupatki - Anaasazi Bikin Region, in Relation to Northern Sinagua Occupation.” *Vegetation History and Archaeobotany*, 2025. https://doi.org/10.1007/s00334-025-01050-x.

Berquist, Stephen, Nicodemo Abate, Nicola Masini, and Alexei Vranich. "From Lost Trenches to Living Data: Using UAV-Mounted LiDAR to Relocate and Contextualize Legacy Excavations at Saqsaywaman, Cusco, Peru." *Archaeological Prospection* (2026).

Khelifi, Adel, et al. "Autonomous service drones for multimodal detection and monitoring of archaeological sites." *Applied Sciences* 11.21 (2021): 10424.

Koprivica, Tatjana, Lucia Alberti, Marilena Cozzolino, Bruna Di Palma, Vincenzo Gentile, and Pasquale Merola. "Integrating Remote Sensing, Archaeological Survey and Geophysical Prospections for the Enhancement of Roman Doclea, Montenegro." *Archaeological Prospection* (2026).

Qubaa, Abdalrahman R., Alaa N. Hamdon, and Taha A. Al Jawwadi. "Morphology detection in archaeological ancient sites by using UAVs/drones data and GIS techniques." *Iraqi Journal of Science* (2021): 4557-4570.

Rinaudo, Fulvio, et al. "Archaeological site monitoring: UAV photogrammetry can be an answer." The International archives of the photogrammetry, Remote sensing and spatial information sciences 39 (2012): 583-588.

Salinas, Jose Capa, and Tyler Lewandowski. "Blue unmanned aircraft systems explained: the current drone market, flight regulations, and debunking common misconceptions." *Transportation research record* 2679, no. 1 (2025): 1802-1813.

Sharp, Kayeleigh, Manuel Antonio Roque Soplapuco, and Izumi Shimada. "From Sky to Soil: UAV-to-pXRF Survey for Minimally Invasive Excavations at Huaca Larga, Lambayeque, Peru." Paper presented at the XIII Congreso Nacional de Arqueología, Universidad Nacional Toribio Rodríguez de Mendoza de Amazonas, Chachapoyas, Peru, October 13–16 (2026) [Forthcoming].

Waagen, Jitte, and Anne van Hilst. "Drones over excavations–Enhancing the archaeologist's eyes. An empirical case study into the deployment of UAS remote sensing as a research tool for archaeological excavation, in Veldhoven, the Netherlands." *Journal of Archaeological Science: Reports* 62 (2025): 105043.