Dig@Lab Duke University, ArcheoDrone LAB

Techno-Archaeology of Landscapes, Cortona, Italy

Course ID: *[IFR will enter the appropriate course ID]*

ONLINE from June 10-14, 2024 and ONSITE from June 16 - July 6 2024

Academic Credits:TBD Semester Credit Units

FIELD SCHOOL DIRECTOR(S)

Dr. Mauzio Forte, Department of Classical Studies, Art, Art HIstory and Visual Studies, Duke University (maurizio.forte@duke.edu)

OVERVIEW

This initiative is part of a long-term research project (directed by Duke University) in the Valdichiana and across the areas of Siena, Cortona, Arezzo and Chianchiano; a region with the highest density of archaeological sites in Tuscany and in Central Italy.

The Cortona (CortonaMia | Touristic Portal of Cortona Town - Tuscany) and Valdichiana regions (Val di Chiana (itstuscany.com)) in Italy are rich tapestries of cultural heritage that span millennia, contributing significantly to our understanding of human history, societal evolution, and the development of ancient civilizations. The area is renowned for its strong ties to the Etruscan civilization, with archaeological sites scattered throughout the region. Exploring these sites can provide insights into the daily lives, social structures, and religious practices of different diachronic settlements.

The strategic location of Cortona and Valdichiana has been inhabited since prehistoric times, witnessing the rise and fall of various civilizations, including the Etruscans, Romans, and later medieval cultures. The Etruscan and Roman periods left a lasting impact on the landscape, with evidence of several settlements, roads, and infrastructure. Paleoenvironmental analyses and the study of archaeological remains in the region contribute to our understanding of governance, urban planning, and economic activities that shaped this part of Italy during antiquity.

The cultural layers of Cortona and Valdichiana provide a chronological record of human occupation and activities, allowing archaeologists to reconstruct the dynamic history of the region through landscape mapping and ground observations. The archaeological sites in Cortona and Valdichiana attract tourists and scholars, contributing to the local economy and fostering cultural exchange. Educational programs like summer courses provide opportunities for students and researchers to engage with the archaeological landscape firsthand, fostering a deeper appreciation for the region's cultural heritage.

In conclusion, Techno-Archaeology of landscapes will design a new map of one of the most important territories in Central Italy.

This intensive summer course combines cutting-edge technologies such as remote sensing, 3D modeling, artificial intelligence (AI), photogrammetry, and digital technologies to unravel the mysteries of the ancient landscapes that surround this picturesque region.

ACADEMIC CREDIT UNITS & TRANSCRIPTS

Credit Units: Attending students will be awarded _ semester credit units (equivalent to _ quarter credit units) through our academic partner, Connecticut College. Connecticut College is a highly ranked liberal arts institution with a deep commitment to undergraduate education. Students will receive a letter grade for attending this field school (see assessment, below). This field school provides a minimum of __ hours of experiential education. Students are encouraged to discuss the transferability of credit units with faculty and registrars at their home institution prior to attending this field school.

Transcripts: An official copy of transcripts will be mailed to the permanent address listed by students on their online application. One more transcript may be sent to the student's home institution at no cost. Additional transcripts may be ordered at any time through the National Student Clearinghouse.

PREREQUISITES

There are no academic prerequisites for this course but a familiarity with archaeology or ancient history would be helpful. However, we will offer some review of these subjects in the "pre-week" offering of the course for those who are unfamiliar.

COURSE OBJECTIVES

This course will teach students the fundamentals of archaeological field survey methodology and the Roman-Etruscan culture through hands-on experience participating in a remote sensing survey project in the Val di Chiana of Tuscany, Italy. How do archaeologists generate knowledge about ancient landscapes? How do they locate sites and investigate ancient cultures? By participating in all phases of the field

survey project, from field walking, to drone flights, AI simulations and post-processing of collected data, students will learn the answer to these questions for themselves. Based in the historic hill-town of Cortona, students will be embedded in an archeological field survey project mapping the cities, sanctuaries, and tombs that composed the ancient Etruscan cultural landscape of the surrounding valley. As participants in the projects, students will learn how to conduct surveys via drone based multispectral imaging, LiDAR, and ground penetrating radar (GPR). The survey project will also provide students with the opportunity to learn about Etruscan culture through primary material and contribute to our understanding of their civilization through their own work.

LEARNING OUTCOMES

By the end of the course, students will be able to:

- Lead and strategize a multidisciplinary project in landscape archaeology
- Identify Etruscan and Roman material culture artifacts
- Employ archaeological field methodology in their research (pedestrian survey, GPS mapping, artifacts identification)
- Employ multimodal non-invasive methods for the study and analysis of ancient landscapes
- Implement 3D laser scanning systems and digital photogrammetry for archaeological and architectural mapping
- Digitally document monuments and archaeological structures by 3D photogrammetry
- Co-pilot multispectral UAVs
- Implement LIDAR and remote sensing technologies for the classification and interpretation of archaeological landscapes
- Use virtual reality, AI and other digital tools for data communication/presentation
- Test AI tools for the simulation and visualization of paleoenvironments and textual analysis
- Survey archeological tracts using traditional methodology and a variety of remote sensing technologies
- Use Geographic Information Systems (GIS) to process, analyze, and visualize data collected in the field
- Optimization and Implementation of dataset for 3D archives and repositories
- Plan and execute a field survey across all stages of a project

ASSESSMENT

Student grades are based primarily on their mastery of the material presented in lectures, readings, as well as in the final assignment. The final grade will be based on the average of grades earned during the course. Specifically:

- Regular participation (15%): Students should have the readings prepared before the Seminars, provide meaningful contribution to discussions, and speak thoughtfully and on topic.

- Lab activity (15%):
- Final assignment (70%):

COURSE SCHEDULE

All IFR field schools begin with a safety orientation. This orientation addresses local and program protocols concerning student behavior, appropriate attire, local practices and sensibilities that may be unfamiliar, potential fauna and flora hazards, IFR harassment and discrimination policies, and the student Code of Conduct.

[Course calendar on following pages]

PREPARATORY ONLINE COURSE (Prior to onsite work in Italy)

All times in Eastern Daylight Time (EDT)!

Week 0 (June 10-14, 2024)

Monday (June 10):

11:00 - 12:30 **Lecture 1**: *Fundamental concepts of archaeology and stratigraphy*

12:00 - 4:00 **Lunch and independent study -** Khan Academy on Etruscan Cultural History Prior to 500 BC

4:00 - 5:30 **Lecture 2**: Etruscan culture through 500 BC

Independent Study - Readings: Archaeology 101; Zubrow and Evans (2006), "Digital Archaeology."

Tuesday (June 11):

11:00-12:30: **Lecture 3:** *Fieldwork methodology and digital archaeology*

12:30-4:00 **Lunch and independent study -** Khan Academy on Etruscan Cultural History After 500 BC

4:00-5:30 **Lecture 4**: *Etruscan Culture into the Roman Period*

Independent study - Readings: Štuhec (2017), "3D Digital Recording: Basics"; Campana (2014), "3D Modeling in Archaeology and Cultural Heritage – Theory and best practice."

Wednesday (June 12):

11:00-12:30 **Lecture 5**: *What is photogrammetry, why is it useful, and how do we use it?*

12:30-4:00 **Lunch and independent study -** Remondino (2014), "Photogrammetry: Theory"; Zachar and Horňák (2017), "3D Recording in Archaeological Practice."

4:00-5:30 **Lecture 6:** *Fundamental concepts of GIS: projections, coordinates, and precision*

Independent study - Readings: Orengo, H. A. (2013), "Combining terrestrial stereophotogrammetry, DGPS and GIS-based 3D voxel modeling in the volumetric recording of archaeological features"

Thursday (June 13):

11:00-12:30 **Lecture 7**: *Topographical measurements with the Total Station and Satellite Positioning Systems (GPS, Differential GPS and GNSS)*

12:30-4:00 **Lunch and independent study -** N. Galiatzatos (2014), "Exploring archaeological landscapes with satellite imagery"; Mozzi et al. (2015), "The Roman City of Altinum, Venice Lagoon, from Remote Sensing and Geophysical Prospection."

4:00-5:30 **Lecture 8**: *Drone types (fixed and rotating wing UAVs), multispectral cameras, and the use of satellite imagery in archaeology*

independent study Verdonck et al. (2020), "Ground-penetrating Radar Survey at Falerii Novi: A new approach to the study of Roman cities"; Forte et al. (2022), "Multimodal Remote Sensing Applications in the Etruscan-Roman City of Vulci."

Friday (June 14):

11:00-12:30 **Lecture 9**: Prospecting methods (Magnetometry, Resistivity, GPR, LiDAR)

12:30-4:00 **Lunch and Independent Study** - Evans (2016), "Airborne laser scanning as a method for exploring long-term socio-ecological dynamics in Cambodia"

4:00-5:30 **Discussion Seminar**: summative discussion of readings and lectures. Students should be prepared to discuss the role of photogrammetry, GIS, and remote sensing in archaeological surveys.

FIELD SCHOOL IN CORTONA (JUNE 16-JULY 6, 2024)

All times in Central European Summer Time (CEST)!
The program may be subject to change!

Week 1 (June 16-22, 2024)

Sunday (June 16):

6:00 PM - 7:00 PM: Arrival and accommodation of students

7:30 PM - 9:00 PM: Group dinner with the Project Director and his team

Monday (June 17):

9:00 AM - 12:30 PM: Welcome and Orientation

12:30 PM - 2:00 PM: Lunch Break

2:00 PM - 4:30 PM: Visit to Cortona city center (the Etruscan walls and the gate Porta Bifora)

4:30 PM - 6:00 PM: Team Building Activities

Tuesday (June 18):

9:00 AM - 12:30 PM: Visit to Cortona necropolis (Tanella di Pitagora, Tanella di Angori, Sodo Archaeological Park)

12:30 PM - 2:00 PM: Lunch Break

2:00 PM - 4:30 PM: Visit to the Museum of the Etruscan Academy and the city of Cortona (MAEC)

4:30 PM - 6:00 PM: Group Activities

Wednesday (June 19):

9:00 AM - 12:30 PM: Field Activity (SfM photogrammetry, data acquisition)

12:30 PM - 2:00 PM: Lunch Break

2:00 PM - 3:30 PM: Guest Lecture

3:30 PM - 6:00 PM: Lab Session (Mertashape, data processing)

Thursday (June 20):

9:00 AM - 12:30 PM: Field Activity (Gps and Total Station measurements)

12:30 PM - 2:00 PM: Lunch Break

2:00 PM - 3:30 PM: Workshop

3:30 PM - 6:00 PM: Lab Session (GIS)

Friday (June 21):

9:00 AM - 12:30 PM: Trip to Lake Trasimeno

12:30 PM - 2:00 PM: Lunch Break

2:00 PM - 3:30 PM: Workshop

3:30 PM - 6:00 PM: Social Event

Saturday (June 22): Day off (Optional, Trip to Montepulciano, Pienza, Val d'Orcia)

Week 2 (June 23-29, 2024)

Sunday (June 23): Day off

Monday (June 24):

9:00 AM - 12:30 PM: Field activity (Copters and Fixed Wing Drones, Multispectral Cameras)

12:30 PM - 2:00 PM: Lunch Break

2:00 PM - 3:30 PM: Project Proposal Brainstorming

3:30 PM - 6:00 PM: Lab session (Remote Sensing, data processing)

Tuesday (June 25):

9:00 AM - 12:30 PM: Field activity (Copters and Fixed Wing Drones, Multispectral Cameras)

12:30 PM - 2:00 PM: Lunch Break

2:00 PM - 3:30 PM: Project Proposal Reviews

3:30 PM - 6:00 PM: Lab session (Remote Sensing, data processing)

Wednesday (June 26):

9:00 AM - 12:30 PM: Field activity (Copters and Fixed Wing Drones, Multispectral Cameras)

12:30 PM - 2:00 PM: Lunch Break

2:00 PM - 3:30 PM: Guest Lecture

3:30 PM - 6:00 PM: Lab session (Remote Sensing, data processing)

Thursday (June 27):

9:00 AM - 12:30 PM: Morning Field Activity

12:30 PM - 2:00 PM: Lunch Break

2:00 PM - 3:30 PM: Workshop

3:30 PM - 6:00 PM: Group Activities

Friday (June 28):

9:00 AM - 12:30 PM: Trip to Chiusi

12:30 PM - 2:00 PM: Lunch Break

2:00 PM - 3:30 PM: Workshop

3:30 PM - 6:00 PM: Group Activities

Saturday (June 29): Day off (Optional, Trip to Siena)

Week 3 (June 30-July 6, 2024)

Sunday (June 30): Day off

Monday (July 1):

9:00 AM - 12:30 PM: Field activity (GPR)

12:30 PM - 2:00 PM: Lunch Break

2:00 PM - 3:30 PM: Group Activities

3:30 PM - 6:00 PM: Lab session (GPR data processing)

Tuesday (July 2):

9:00 AM - 12:30 PM: Field Activity (LiDAR)

12:30 PM - 2:00 PM: Lunch Break

2:00 PM - 3:30 PM: Group Activities

3:30 PM - 6:00 PM: Lab session (LiDAR data processing, AI applications)

Wednesday (July 3):

9:00 AM - 12:30 PM: Field Activity

12:30 PM - 2:00 PM: Lunch Break

2:00 PM - 3:30 PM: Guest Lecture

3:30 PM - 6:00 PM: Group Activities (AI applications)

Thursday (July 4):

9:00 AM - 12:30 PM: Field Activity

12:30 PM - 2:00 PM: Lunch Break

2:00 PM - 4:30 PM: Workshop

4:30 PM - 6:00 PM: Group Activities

Friday (July 5):

9:00 AM - 12:30 PM: Group Activities

12:30 PM - 2:00 PM: Lunch Break

2:00 PM - 6:30 PM: Project Presentations

7:30 PM - 9:00 PM: Social Dinner

Saturday (July 6): Departure of students

REQUIRED READINGS

PDF files of all mandatory readings will be provided to enrolled students. Students are encouraged to download and/or print readings prior to traveling. Course participants are expected to be prepared to engage the discussions led by facilitators, all of whom will be looking for compelling evidence that students have read and thought about the assigned readings prior to the scheduled day on which they are first discussed.

Archaeological Institute of America. “Archaeology 101.” https://www.archaeological.org/pdfs/education/Arch101.2.pdf

Campana, S. (2014). “3D Modeling in Archaeology and Cultural Heritage – Theory and best practice.” In *3D Recording and Modelling in Archaeology and Cultural Heritage*, eds. Remondino, F., & Campana, S.: 7-12. BAR International Series, 2598.

Evans, D. (2016), “Airborne laser scanning as a method for exploring long-term socio-ecological dynamics in Cambodia”, *Journal of Archaeological Science 74*, 164-175.

Maurizio Forte, Immo Trinks, Alois Hinterleitner, Michael Klein, Antonio LoPiano, Katherine McCusker, Hannes Schiel, Ingrid Schlögel, Tanja Trausmuth, Alexandra Vonkilch, Mario Wallner & Wolfgang Neubauer (2022) Multimodal Remote Sensing Applications in the Etruscan-Roman City of Vulci, *Journal of Field Archaeology*.

Galiatzatos, N. (2014), “Exploring archaeological landscapes with satellite imagery.” In 3*D Recording and Modelling in Archaeology and Cultural Heritage*, eds. Remondino, F., & Campana, S.: 91-102. BAR International Series, 2598.

Mozzi, P., A. Fontana, F. Ferrarese, A. Ninfo, S. Campana, R. Francese (2015). “The Roman City of Altinum, Venice Lagoon, from Remote Sensing and Geophysical Prospection” in *Archaeological Prospection 23*. 10.1002/arp.1520

Orengo, H. A. (2013), "Combining terrestrial stereophotogrammetry, DGPS and GIS-based 3D voxel modelling in the volumetric recording of archaeological features", *ISPRS Journal of Photogrammetry and Remote Sensing, 76:* 49-55. Available at: http://www.sciencedirect.com/science/article/pii/S0924271612001542

Remondino, F. (2014), “Geomatic and Cultural Heritage.” In *3D Recording and Modelling in Archaeology and Cultural Heritage*, eds. Remondino, F., & Campana, S.: 13-14. BAR International Series, 2598.

Štuhec, S. (2017), “3D Digital Recording: Basics.” In *3D Digital Recording of Archaeological, Architectural and Artistic Heritage*, eds. Novaković, P., M. Hornak, M. Zachar, and N. Joncic: 15-22. University of Ljubljana Press: Ljubljana.

Verdonck, L., Launaro, A., Vermeulen, F., & Millett, M. (2020). “Ground-penetrating Radar Survey at Falerii Novi: A new approach to the study of Roman cities.” Antiquity, 94(375), 705-723.

Zachar, J. and Horňák, M. (2017) “3D Recording in Archaeological Practice.” In 3*D Digital Recording of Archaeological, Architectural and Artistic Heritage*, eds. Novaković, P., M. Hornak, M. Zachar, and N. Joncic: 53-84. University of Ljubljana Press: Ljubljana.

Zubrow, E. B., Evans, T. L., & Daly, P. (2006). “Digital Archaeology.” In *Digital Archaeology. Bridging method and theory,* London: 10-31.

SOFTWARE

Software provided to students: Metashape (1 month license), QGIS

PART II: TRAVEL, SAFETY & LOGISTICS

NOTICE OF INHERENT RISK

Traveling and conducting field research can involve risk. The IFR engages in intensive review of each field school location and programming prior to approval. Once a program is accepted, the IFR reviews each program annually to make sure it still complies with all our standards and policies, including those pertaining to student safety. Participants should also take every reasonable step to reduce risk while on IFR programs, including following the safety advice and guidelines of your program director, being alert to your surroundings and conditions, letting someone know where you will be at all times, and assessing your personal security.

The IFR does not provide trip or travel cancellation insurance. We strongly encourage participants to consider purchasing this insurance, as unexpected events may prevent your participation or cause the program to be canceled. Insurance is a relatively small cost to protect your educational investment in an IFR program. When comparing trip cancellation insurance policies, make sure the policy covers the cost of both airfare and tuition.

We do our best to follow a schedule of activities, methods training, and programming as outlined in this syllabus. However, this schedule can be easily disrupted by unforeseen circumstances, including weather, revisions by local permitting agencies, or conditions onsite. While this schedule represents the intentions of the program, adaptability is an intrinsic part of all field research, and necessary alterations to the schedule may happen at any time.

If you have any medical concerns, please consult with your doctor. For all other concerns, please consult with the program director and staff.

PROGRAM SPECIFIC FIELD CONDITIONS

Tuscany can be quite warm during the summer months, as will likely come as no surprise. However, what may surprise first time visitors is that air conditioning is not so abundant outside of the United States. We will be in the field during the early parts of July, before the hottest time of the summer sets in, but students should still be prepared to acclimate to the heat.

ACTIVITY LEVEL

Archaeological field survey work requires participants to be able to walk over moderate distances - a few kilometers at a time. It may also entail some lifting and carrying of drones, equipment, and backpacks. However, there is no planned excavation for this project so there will be less crouching, kneeling, and bending than an excavation project.

VISA REQUIREMENTS

As soon as you enroll in the field school, we recommend checking your passport expiration date. If you do not have a passport, please apply for one right away! Your passport should be valid for at least six months after your departure date.

Non-E.U. visitors, including U.S. citizens, arriving overland in Italy from another Schengen state (Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden or Switzerland) must request a declaration of presence form from a local police office (commissariato di zona), police headquarters (questura), or their first place of stay and submit the completed form to the police or their place of stay within eight business days.

Citizens of other countries are asked to check the Italian Embassy website page at their home country for specific visa requirements.

Embassy of Italy to the U.S.
3000 Whitehaven Street, N.W.
Washington, D.C. 20008
Tel. +1 (202) 612-4400

U.S. Consulate in Florence
Lungarno Vespucci, 38
50123 FLORENCE
Phone: (+39) 055.266.951

U.S. Embassy in Rome
via Vittorio Veneto 121
00187 Roma
Tel. (+39) 06-46741 (switchboard)

STUDENT HEALTH

An IFR field school is designed to provide safe, positive, and constructive experiences for participating communities, students, and researchers. We are committed to protocols and practices that support the health and well-being of all involved in our field school projects, including the members of the community in which these projects take place.

We recommend that students adopt best-practices for arriving in a good state of health to protect themselves and their peers' readiness to set about the work of the field school. A thriving field camp environment is a constant exchange of energy, patience, effort, respect, and service. Arriving healthy is every student's first act of service — their first opportunity to behave in a way that respects the safety and wellness of one another.

TRAVEL (TO AND DURING THE PROGRAM)

Natural disasters, political changes, weather conditions and various other factors may force the cancellation or alteration of a field school. IFR recommends students only purchase airline tickets that are fully refundable and consider travel insurance in case a program or travel plans must change for any reason. General information for this program is below, but keep in mind we will discuss any updated travel information and regulations during the required program orientation, which could affect travel plans.

Students will fly into Leonardo da Vinci–Fiumicino Airport in Rome by the morning of June 16th and then take the train to Camucia-Cortona where they will be picked up by the field directors. We will assist

students in acquiring the proper train tickets and how to navigate the train system during orientation. All other official program travel, such as daily travel to and from sites and to program events, will be provided by the program. Students may choose to make their own arrangements to travel by bus or train on the weekend to nearby cities such as Florence, Siena, or Orvieto.

If you missed your connection or your flight is delayed, please call, text or email the field school director immediately. A local emergency mobile phone number will be provided to all enrolled students.

ACCOMMODATIONS

Accommodations are provided by the city of Cortona in the location of Camucia (a few miles from the city center). They are fully equipped apartments with laundry facilities, a kitchen and all the accessories. There is room for about 20 people to be accommodated in different, separate rooms. Lunch (lunch boxes) will be provided during all fieldwork activity days. It is important to communicate in advance dietary restrictions, allergies and other important information about food preferences.
Students are responsible for their own dinner and breakfast (there are several supermarkets within walking distance from the apartments). Students are responsible for their own food on weekends.

EQUIPMENT LIST

Students must bring a computer with at least a quad core processor and 8 gb of RAM. You can check to see what your PC has by opening the settings menu and navigating to the “About” tab. On a Mac, open the menu by clicking the apple logo in the upper left corner of the screen and selecting “About this Mac.” If you do not have a computer that meets these specifications, you can rent a cloud computer through this service that will allow you to access a desktop with the required specifications remotely through the internet. Be sure to select the “Pro Standard” option.