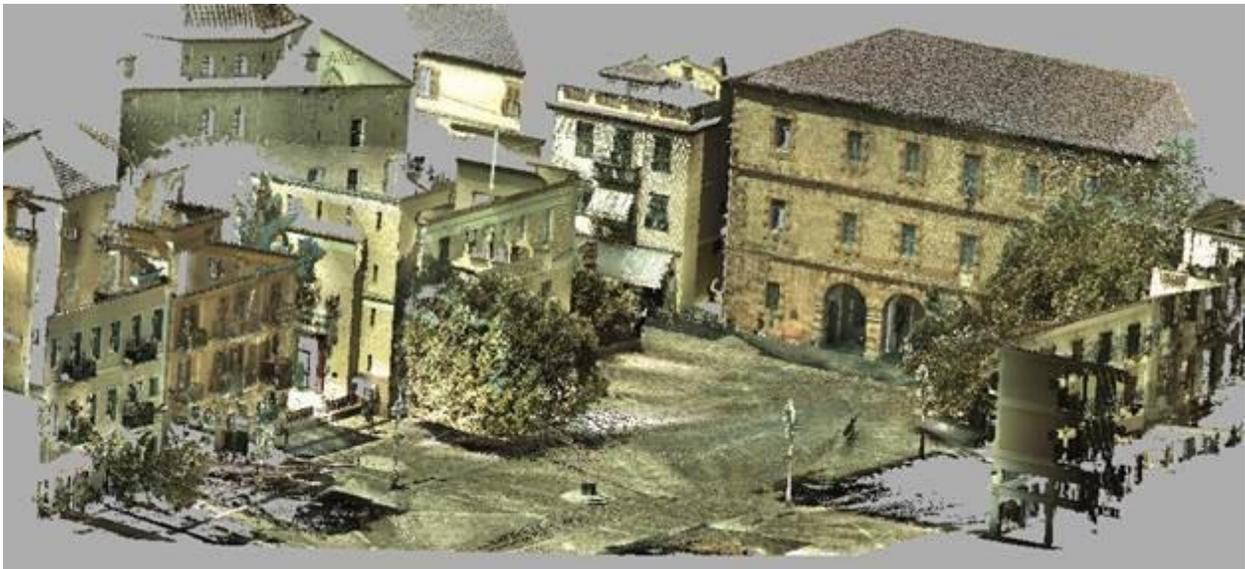


# HERITAGE

THE HERITAGE MANAGEMENT ORGANIZATION

*Digital Tools for Heritage Management:  
3D Laser Scanning and Photogrammetry*

*21 May – 16 June, 2018  
Nafplion, Greece*



## **DIRECTORS:**

*Dr. Evangelos Kyriakidis* | University of Kent, The Heritage Management Organization  
([director@inherity.org](mailto:director@inherity.org))

*Dr. Michele Curuni* | Leica Geosystems HDS, Italy

## **INSTRUCTOR:**

*Dr. Cornelis Stal* | Hogeschool Gent/University College Ghent, Belgium

## **INTRODUCTION**

The field school is a collaborative effort between the Heritage Management Organization and its partners – the Center for Advanced Spatial Technologies at the University of Arkansas, Fayetteville (CAST) and Leica Geosystems. The Heritage

# HERITAGE

## THE HERITAGE MANAGEMENT ORGANIZATION

Management Organization has been asked by the municipality of Nafplion, the first capital of modern Greece, to document its most historically significant structures and city center. Using professional-grade laser scanners, the objective of this project is to record the structural data of these buildings, properly orient them to one another in virtual space, and georeference the data we collect to ultimately create a computer-generated representation of historic Nafplion. This representation will be used as essential tools in heritage management for any restoration, documentation or visualization project.

The field school will serve as the education arm of a larger research project conducted by the Heritage Management Organization in collaboration with CAST, ETH Zurich, Leica and other partners aiming to create and promote applications for the use of 3D documentation for heritage management. Amongst our goals is to create an application for 3D recording of archaeological sites for conservation purposes. Research is also conducted on ways and techniques to speed up the digitization of archaeological sites such as the development of techniques to map conservation needs of sites on the 3D plan, techniques and software that will help photography and laser scanning to work faster and more efficiently together, or better and more efficient ways to present different types of evidence in an online format.

In the past two years, our field program has benefitted by the involvement of specialists from Leica Geosystems from Italy and Greece, and UAV technologists from ETH Zurich in Switzerland.

### **COURSE OBJECTIVES**

This field school will introduce students to a broad range of 3D recording and mapping techniques. Students will be provided with hands-on instruction in these methods in the context historical structure at the city of Nafplion. Students will record the site's extensive architectural remains using terrestrial laser scanning, GIS and GPS. Students should be able to work in the digitization of any site following this work.

### **PREREQUISITES**

There are no prerequisites for this field school. Students should be aware that this is an archaeological project and work will be done mostly in the outdoors. Weather conditions, therefore, will have an impact on work and students should come prepared to either hot and dry or rainy conditions.

# HERITAGE

## THE HERITAGE MANAGEMENT ORGANIZATION

### GRADING MATRIX

**Examinations** **30%**

Exam 1: Monday, Week 2: *Preliminary Readings & LiDAR Basics* 10%

Exam 2: Monday, Week 3: *Data Collection Standards & Cyclone* 10%

Exam 3: Monday, Week 4: *Advanced Concepts in 3D Documentation* 10%

**Fieldwork** **20%**

Student performance will be graded primarily on demonstrated field ability and will be engaged in daily practice with HDS hardware.

**Individual Presentation** **50%**

Each student will be expected to prepare a unique presentation examining applications of 3D documentation technology to their current research focus. A digital presentation (powerpoint or other) will be submitted, and an oral presentation will be graded according to quality of delivery (presentation structure, quality of presentation and images, clarity), accuracy of information, audience engagement, and Q&A

### DISCLAIMER – PLEASE READ CAREFULLY

Archaeological field work involves physical work in the outdoors. You should be aware that conditions in the field are different than those you experience in your home, dorms or college town. This program operates at a typical archaeological survey despite it is in a city. During the day, temperatures under the shadow fluctuate between 70<sup>o</sup>-90<sup>o</sup>F. However, under the sun they may reach 80o-120o. Humidity is relatively medium and some mosquitoes and/or flies may be close to the area. In order to be protected from sunburn and/or insects you will not be allowed to work in shorts or tank tops and you will have to be responsible to avoid dehydration, sunburns and sunstrokes.

If you have any medical concerns, please consult with your doctor. For all other concerns, please consult with the project director – as appropriate.

### TRAVEL & MEETING POINT

Arrival day in Greece: Sunday 20 May. Students will received detailed information on how to reach their final destination in Nafpion (after arriving in Athens Eleftherios

# HERITAGE

## THE HERITAGE MANAGEMENT ORGANIZATION

Venizelos International Airport); if possible, it can be arranged for participants to be met at the Corinth *Proastiacos* (Suburban Rail) train station at pre-arranged times to fit with most inbound flights. If your flight is delayed or you missed your connection, please call, text or email the project director. An emergency local cell phone number will be provided to all enrolled students.

This field school will conclude on Saturday, 16 June. Students should plan onward travel or return home for anytime during Sunday, 17 June.

### ACCOMMODATIONS

Students will be housed in rooms at part of a local nursing home for the elderly, or *gerokomeio* – the Maria Radou Foundation. Rooms for students have been separated from the normal function of the *gerokomeio*. The Foundation is located in a safe location in Nafplion and in close proximity to the facilities, where most of the computer work will take place. One student meal will be catered per day.

Food in Greece is rich with vegetables and fruits. Some diets may be accommodated but not all. Please consult with the project administrator if you have special dietary needs.

### PROGRAM FEES AND COURSE CREDIT

The participation cost for this program is \$ 5000. This covers all course costs including registration, program materials, shared accommodation, and one meal per day (excluding free days). There is a number of scholarships available, which are awarded after acceptance into the program, so interested students are strongly advised to apply early for eligibility and to contact us for more information.

If you would like to take this course for credit, the suggested credit amount is equivalent to one nine credit semester/term module, based on contact hours, field work, and course content. We prefer to allow students' home institutions to calculate credit hours and award credit accordingly. We will support your request for credit by supplying any relevant documentation and/or supporting materials.

### COURSE SCHEDULE

Please note that this program is intensive and consists of a 6 day work-week (Monday through Saturday). Our High Definition Scanning equipment cannot be used in all weather conditions, and therefore the course schedule is subject to change or

# HERITAGE

## THE HERITAGE MANAGEMENT ORGANIZATION

modification. Here follows an indicative schedule for your information and for your teachers' interest.

0. **Sunday 20 May**, meeting of all students at 6pm in the Maria Radou Foundation. First introduction of the students.
  
1. **Week 1 – Day 1: Monday (21 May)**
  - a. Overview of the HMO.Digital Historic Nafplion Project and objectives for field school
  - b. Explanation of field school logistics and walking tour of Nafplion
  - b. Lecture on the site of Nafplion in the context of the Greek history
  - d. Brief overview of purposes and role(s) of heritage visualization
  
2. **Week 1 – Day 2: Tuesday (22 May)**
  - a. Introduction to Archaeology and Methods
  - b. Introduction to the Laser Scanning project at Eleusis
  - c. Laser scanning demonstrations
  - d. Introduction on point cloud software
  
3. **Week 1 – Day 3: Wednesday (23 May)**
  - a. Introduction to Equipment Setup, Care, and Safety
  - b. Laser scanning fieldwork
  - c. Introduction to Cyclone interface: navigating the 3D environment
  - d. Lecture: The Importance of Resolution
  
4. **Week 1 – Day 4: Thursday (24 May)**
  - a. Laser scanning fieldwork
  - b. Data processing: Cleaning and Registration
  - c. Review of *Geospatial Modeling and Visualization* resources (<http://gmv.cast.uark.edu>)
  - d. Review of Angie Payne's Guides to Good Practice Laser Scanning
  - e. Lecture: The Importance of Metadata
  
5. **Week 1 – Day 5: Friday (25 May)**
  - a. Laser scanning fieldwork

# HERITAGE

## THE HERITAGE MANAGEMENT ORGANIZATION

- b. Data processing: Cleaning and Registration; General Processing
  - c. Discuss assigned readings as pertains to fieldwork
  - d. Lecture: Introduction to Photography
6. **Week 1 – Day 6: Saturday (26 May)**
- a. Laser scanning fieldwork
  - b. Data processing: Cleaning and Registration; General Processing
  - c. **Review Week 1: Feedback meeting & Exam expectations**
  - d. Lecture: Introduction to Photogrammetry
7. **Week 2 – Day 1: Monday (28 May)**
- a. Laser scanning fieldwork
  - b. Data processing: UCS, slicing, and partitioning; General Processing
  - c. **Examination 1: Laser Scanning**
8. **Week 2 – Day 2: Tuesday (29 May)**
- a. Laser scanning fieldwork and image acquisition
  - b. Data processing: Digitizing; General Processing
  - c. Review: Discuss assigned readings as pertains to fieldwork
  - d. Lecture: Airborne photogrammetry and unmanned aerial systems (UAS)
9. **Week 2 – Day 3: Wednesday (30 May)**
- a. Data acquisition: Laser scanning fieldwork and image acquisition
  - b. Data Processing: Agisoft Photoscan; General Processing
  - c. Review: Discuss assigned readings as pertains to fieldwork
  - d. Lecture: State-of-the-art in terrestrial laser scanning
10. **Week 2 – Day 4: Thursday (31 May)**
- a. Data acquisition: Laser scanning fieldwork and image acquisition
  - b. Data Processing: Agisoft Photoscan; General Processing
  - c. Review: Discuss assigned readings as pertains to fieldwork
  - d. Lecture: Mobile laser scanning
11. **Week 2 – Day 5: Friday (1 June)**
- a. Data acquisition: Laser scanning fieldwork and image acquisition
  - b. Data Processing: Agisoft Photoscan; General Processing

# HERITAGE

## THE HERITAGE MANAGEMENT ORGANIZATION

- c. Review: Discuss assigned readings as pertains to fieldwork
  - d. Lecture: Importing and exporting scan data
12. **Week 2 – Day 6: Saturday (2 June)**
- a. Data acquisition: Laser scanning fieldwork and image acquisition
  - b. Data Processing: Autodesk ReCap; General Processing
  - c. **Review Week 2:** Feedback meeting & exam expectations
  - d. Instructor's evaluations
13. **Week 3 – Day 1: Monday (4 June)**
- a. Data processing: Digitizing; CloudCompare; General processing
  - b. Lecture: Visualization Tools within Cyclone
  - c. **Examination 2: Photogrammetry**
14. **Week 3 – Day 2: Tuesday (5 June)**
- a. Data acquisition: Laser scanning fieldwork and image acquisition
  - b. Data processing: Generating animations; CloudCompare; General processing
  - c. Review: Discuss assigned readings as pertains to fieldwork
15. **Week 3 – Day 3: Wednesday (6 June)**
- a. Data acquisition: Laser scanning fieldwork and image acquisition
  - b. Data processing: PoTree point cloud visualization; General processing
  - c. Review: Discuss assigned readings as pertains to fieldwork
16. **Week 3 – Day 4: Thursday (7 June)**
- a. Data acquisition: Image acquisition
  - b. Data processing: PoTree point cloud visualization; General processing
  - c. Review: Discuss assigned readings as pertains to fieldwork
  - d. Lecture: Cultural heritage and geographic information systems (GIS)
  - e. Lecture: Creating solid 3D from point clouds
17. **Week 3 – Day 5: Friday (8 June)**
- a. Data acquisition: Image acquisition
  - b. Data Processing: GIS processing; General processing
  - c. Review: Discuss assigned readings as pertains to fieldwork
  - d. Examination: preparation for individual presentations

# HERITAGE

## THE HERITAGE MANAGEMENT ORGANIZATION

- e. Lecture: Coordinate systems and cartography
  
- 18. **Week 3 – Day 6: Saturday (9 June)**
  - a. Data acquisition: image acquisition
  - b. Data processing: GIS processing; General processing
  - c. **Review Week 3:** Feedback meeting & Exam expectations
  
- 19. **Week 4 – Day 1: Monday (11 June)**
  - a. Data acquisition: image acquisition
  - b. Data processing: General processing
  - c. Review: Progress Report for our Site
  - d. **Examination 3:** *GIS and spatial data management*
  
- 20. **Week 4 – Day 2: Tuesday (12 June)**
  - a. Data acquisition: Image acquisition
  - b. Data processing: General processing
  - c. Review: Discuss assigned readings as pertains to fieldwork
  - d. Examination: Preparation of Individual Presentations
  - e. Lecture: Online GIS environments and data
  
- 21. **Week 4 – Day 3: Wednesday (13 June)**
  - a. Data acquisition: Image acquisition
  - b. Data processing: GIS processing; general processing
  - c. Review: Discuss assigned readings as pertains to fieldwork
  - d. Examination: Preparation of Individual Presentation
  
- 22. **Week 4 – Day 4: Thursday (14 June)**
  - a. Data processing: GIS processing; general processing
  - b. Review: Discuss assigned readings as pertains to fieldwork
  - c. Examination: Preparation of Individual Presentations
  
- 23. **Week 4 – Day 5: Friday (15 June)**
  - a. Data processing: GIS processing; general processing
  - b. **Examinations: Individual Presentations**

# HERITAGE

## THE HERITAGE MANAGEMENT ORGANIZATION

24. **Week 4 – Day 6: Saturday (16 June)**
  - a. Final Feedback Meeting, Exam expectations and Instructor Evaluations
  - b. **Examinations: Individual Presentations**
  
25. **Week 4 – Day 7: Sunday (17 June)**  
Departure

### **REQUIRED READINGS and RECOMMENDED READINGS**

*The final titles will be made available to participants only in due time before the beginning of the summer school program. When so, they are required to have been read and understood by the end of the four weeks duration of the summer school. It would be an advantage if participants had read some of the required literature prior to their arrival in Nafplio.*