Institute of Archaeology

ARCL0148 DIGITAL HERITAGE: APPLICATIONS IN HERITAGE MANAGEMENT

2023-24, Term 2

MA module
15 credits

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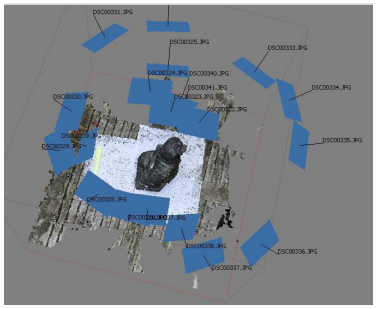

IMPORTANT INFORMATION REGARDING ASSESSMENTS:

The **coursework coversheet** is available on the course Moodle pages and here: https://www.ucl.ac.uk/archaeology/current-students under "Policies, Forms and Guidelines".

Please enter **your five-digit candidate code on the coversheet and *in the subject line*** when you upload your work in Moodle.

Please use **your five-digit candidate code as the name of the file** you submit.

Please refer to https://www.ucl.ac.uk/archaeology/current-students/ioa-student-handbook/13-information-assessment
https://www.ucl.ac.uk/archaeology/current-students/ioa-study-skills-guide/referencing-effectively-and-ioa-guidelines
https://www.ucl.ac.uk/students/exams-and-assessments/academic-integrity
https://library-guides.ucl.ac.uk/referencing-plagiarism/acknowledging-AI
for instructions on coursework submission, IoA referencing guidelines and marking criteria, as l as UCL policies on penalties for late submission, over-length work, the use of text generation software (AI) and academic misconduct.

1. MODULE OVERVIEW

Module description

Digital Heritage: Applications in Heritage Management module introduces students to the latest developments in the use of digital technologies for documentation and management of heritage across the world. The sessions look at different tools, software packages, approaches and outcomes by continuously linking them to real-world challenges presented by archaeological finds, sites, historic buildings, museums, and wider heritage management institutions. The module is about providing students with an opportunity to understand heritage documentation and management theory through familiarisation sessions using digital tools. It will showcase the achievements and demonstrate the role of UCL Institute of Archaeology in this developing area, reflecting its expertise and capabilities as part of its Photographic Laboratory. The course is designed to look at the latest developments and to remain very contemporary.

It has become increasingly clear over the last several years that learning about the practical use of digital technologies in the areas of site and object documentation, condition assessment and interpretation strategies is a major attraction for students. Therefore, the module is not specifically designed to teach 'digital' - although the students will gain new digital competencies as part of the course - but the programme has been developed with the view of demonstrating the benefits of digital tools for the modern-day, and holistic management of heritage. Increased emphasis on digital documentation, presentation and display will enable an expanded focus for the module that goes beyond the use of digital technologies to document and monitor the heritage; the course will also explore how the datasets are curated and communicated.

Module Aims

One of the module's main aims is giving students an opportunity to carry out practical tasks with relevance to a real-life heritage management and research environments.

- To provide an understanding of the processes and approaches used in digital form in order to implement value-based management, conservation and interpretation of a heritage site or object
- To encourage innovative digital approaches
- To develop team-working skills applicable to the working world
- To look at the theoretical background underpinning digital heritage and digital humanities

The module will give students an opportunity to carry out practical tasks with relevance to a real-life heritage management and research environment.

Learning Outcomes

Students will become familiar with advanced methods for heritage documentation and condition assessment, and how to use fully digital solutions for the benefit of heritage management. Familiarisation includes 2- and 3-dimensional recording techniques with focus on cheap and rapid tools for comprehensive modelling, analysis and monitoring of heritage objects and sites. It gives students an opportunity to learn professional heritage management skills – written and practical – in a supportive and team-based environment. Students are expected to work in on an individual portfolio project.

On successful completion of this module a student should:

- Critically assess ways in which heritage management theory and practice interact
- Understand how their learning can be applied in the working world
- Be able to discuss their practical work with future employers

On successful completion of the module students should also be able to demonstrate:

- Observation and critical reflection
- Application of acquired knowledge
- Written and oral presentation skills

Method of Assessment

Portfolio (3000 words, 100%)

Communications

- **Moodle is the main hub** for this course.
- Important information will be posted by staff in the **Announcements section of the Moodle page** and you will automatically receive an email notification for these.
    - Please post any general queries relating to module content, assessments and administration **in the MS Teams Module forum** (*https://moodle.ucl.ac.uk/course/view.php?id=40796*). The forum will be checked regularly but mainly Monday to Wednesday.
- For personal queries, please contact the Co-ordinator by email.

Week-by-week summary

Week		Date	Topic	Lecturers
1		9 Jan	Introduction to digital documentation in heritage. What this course is about?	KEP
2		16 Jan	Advanced photography and computational processing for 2D heritage documentation	KEP
3		23 Jan	From 2D + to 3D: Photogrammetry, Satellite imagery and airborne remote sensing: historical overview and current trends	KEP
4		30 Jan	Unveiling the past and preserving the future with drone technology and photogrammetry for archaeology and heritage (Greenwich)	AR and KEP
5		6 Feb	Laser scanners and LIDAR - application of active sensors for 3D documentation, monitoring and conservation + Assessment	AR and KEP
6		READING WEEK		
7		20 Feb	Landscape-level data visualisation and GIS + Assessment	GA and KEP
8		27 Feb	Digitisation of conventional records, archives and historical collections, and ethical considerations	KEP
9		5 Mar	Curating the data: Long-term sustainability and Open data	KEP
10		12 Mar	Digital recording of objects, Crowdsourcing and benefitting from recent advances of information technologies	KEP
11		19 Mar	Conclusions (Including discussions over digital footprint and our 'heritage' in born- digital version)	KEP

Lecturers (or other contributors): Dr Kathryn E. Piquette (KEP), Mr Antonio Reis (AR) and Dr Georgia Andreou (GA).

Weekly Module Plan

The module is taught through lectures and discussions. Each week will have a message via Moodle with recommended additional materials (mostly videos, interactives, and short case studies). Students will be required to undertake set readings and complete pre-class activities before the sessions on Tuesday in order to be able to actively participate in the discussion.

In broad terms, the weeks of the term are divided into major areas of interest and investigation. Through those specific areas, we will also look at wide variety of contemporary issues of digital aspects of heritage management, and support those with extensive range of case studies and discussions of the best practice.

Each week's learning will be supported by essential reading, recommended and optional reading. There will be continuously updated online reading list https://ucl.rl.talis.com/modules/arcl0148.html) containing materials available online on open-access and via UCL Library access.

Additional readings and learning materials in the form of news articles, reports and datasets will be made available on Moodle under each weekly session. They will be used to facilitate seminar discussions.

Workload

This is a 15-credit module which equates to 150 hours of learning time including session preparation, background reading, and researching and writing your assignments. With that in mind you are expected to organise your time roughly in this manner:

20 hours	*Staff-led teaching sessions (lectures, seminars, tutorials)*
60 hours	*Self-guided session preparation (reading, listening, note-taking and online activities), about 6 hours a week*
70 hours	*Reading and preparing for, and writing, the assignments*

2. Assessment (Portfolio: 3,000 words; Deadline: Monday 29th April 2024)

The main assignment will take the form of a report on the development of a hypothetical digitisation pilot project. The course coordinator will work with each student closely to agree a specific project and to provide full support. Further details will be announced in the second session and there will be opportunities to discuss the assessment and present elements of the work in class for feedback.

If students are unclear about the nature of an assignment, they should discuss this with the module co-ordinator in advance (via office hours or class Moodle forum). You will receive feedback on your written coursework via Moodle, and have the opportunity to discuss your marks and feedback with the co-ordinator in their office hours.

For more details see the 'Assessment' section on Moodle. The coursework coversheet is available on the course Moodle pages and here: https://www.ucl.ac.uk/archaeology/current-students under "Policies, Forms and Guidelines".

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Please use your five-digit candidate code as the name of the file you submit.

The IoA marking criteria can be found in the IoA Student Handbook (Section 13: Information on assessment). The IoA Study Skills Guide provides useful guidance on writing different types of assignment.

Please note that **late submission, exceeding the maximum word count** and **academic misconduct (unacknowledged use of text generation software*** and **plagiarism)** will be penalized and can significantly reduce the mark awarded for the assignment and/or overall module result. Please do consult

- https://www.ucl.ac.uk/archaeology/current-students/ioa-student-handbook/13-information-assessment with sections 13.7–13.8: coursework submission, 13.10: word count, 13.12–14: academic integrity
- https://www.ucl.ac.uk/students/exams-and-assessments/academic-integrity for UCL's guidance on academic integrity
- https://library-guides.ucl.ac.uk/referencing-plagiarism/acknowledging-AI for UCL's guidance on how to acknowledge the use of text generation software.

* **Note:** The use of software to generate research and content is not allowed for marked assessments for this course and will be penalized; the use of software for language and writing review and improvement is permitted (e.g. Grammarly), and the software and the way it has been used must be indicated in the relevant boxes on the coursework coversheet. UCL defines language and writing review as checking "areas of academic writing such as structure, fluency, presentation, grammar, spelling, punctuation, and language translation".

3. RESOURCES AND PREPARATION FOR CLASS

Preparation for class

You are expected to read the **two essential readings as well as familiarising yourself with suggested materials on Moodle** each week. Completing the readings is essential for your effective participation in the activities and discussions that we will do, and it will greatly enhance your understanding of the material covered. **Further readings are provided via the Online Reading List** for you to get a sense of the range of current work on a given topic and for you to draw upon for your assessments. The online reading list is accessible through the Moodle page of the module, or directly here: https://ucl.rl.talis.com/modules/arcl0148.html. It is essential that you check the online reading list regularly.

4. SYLLABUS

Week 1: Introduction to digital documentation in heritage. What this course is about?

The session will start with discussions of the Digital Heritage in its wider meanings and then explain what this course is trying to achieve and why it was created as a specific module. What are the major advantages of using digital tools and techniques in archaeology and heritage management? How the evolution from conventional, mostly paper-based methods to full-digital took place and can we envisage certain future trends by looking back at that evolution? How much the ongoing restrictions of access and travel is influencing the acceleration of the move into 'digital' within the heritage institutions? How important are the digital competences for a modern-day heritage specialist and where are the major sources of knowledge in this area?

The session will also discuss the digital documentation in differing scales: from objects to

sites and to large landscapes. Subsequently, it will broadly address the different tools and techniques that are going to be discussed in detail as part of the module.

As a group discussion, we will also test our knowledge of digital data and its formats. Do we know the difference between raster and vector, lossy and lossless, proprietary and non-proprietary, etc? What are the basic concepts that one needs to be aware of in order to support their digital skills and knowledge?

Week 2: Advanced photography and computational processing for 2D heritage documentation.

Since its inception, photography has played a vital role in the heritage sector for documentation and dissemination of its historical and cultural assets with the goal of furthering study and enhancing scholarship. With the digital age comes a plethora of new imaging technologies and methods, with silicon sensor capture devices ranging from a mobile phone to a high quality DSLRs. We will direct attention to DSLR-based methods in the session, looking briefly at general photography, focus stacking, photo-stitching, and the subsequent use of such image data with further computer processing techniques such as decorrelation stretching. Spectral imaging (multi-band, multi-spectral, hyperspectral), and other 2D technique provide further advanced methods for documentation, feature enhancement, monitoring, and non-destructive methos of materials analysis. Underpinning our discussion will be questions of accuracy, authenticity, subjectivity versus objectivity in documentation and interpretation.

Week 3: From 2D+ to 3D: Photogrammetry, satellite imagery and airborne remote sensing: historical overview and current trends

Among many approaches currently used by the heritage specialists for high-resolution recording of different assets, a couple of approach stands out for their ease of implementation and for advantages in terms of rapid documentation. The session will provide general overview of polynomial texture mapping, now known as reflectance transformation imaging (RTI), and 3D imaging using photogrammetric recording (or Structure from Motion (SfM), as it is otherwise known). We will discuss the advantages and disadvantages of these approach. Could these revolutionise aspects of the documentation process? How do they compare to more prominent documentation techniques such as 3D laser scanning? Can photogrammetric recording deliver full survey datasets that traditionally relied on combination of several tools and techniques such as differential GPS units and tacheometer?

If used widely and supported properly photogrammetric recording offers relatively easy learning curve as well as scalability from small objects to large landscapes, and therefore is seen as one of the easiest skills that can be gained as part of the short trainings. The course coordinator has an extensive experience in experimenting with this particular approach and training the specialists in different parts of the world, and some of the case study discussions will be based on those experiences. We will also focus on the ‘rapid’ part of the topic and discuss it as an approach for documenting heritage under threat.

The Space Race in the second part of the 20th century, and later proliferation of the Earth’s lower orbit with multitude of different satellites, sensors and satellite systems created a range of tools that continuously found new implementations for different scientific research endeavours. Uniform satellite imagery coverage of the Earth’s surface started to become

available to wider public in early 21st century, initially via the web interfaces and later through dedicated software packages such as Google Earth. The session will also discuss the benefits as well as the challenges of using remote sensing data in heritage management.

Week 4: Unveiling the past and preserving the future with drone technology and photogrammetry for archaeology and heritage (AR and KEP) (Greenwich)

Recent technological advances resulted in rapid proliferation of 'drones' or Unmanned Aerial Vehicles (UAV) into our lives. They are becoming omnipresent and loved and feared almost in equal measure, if to judge the reaction by their media coverage. For archaeology and heritage management, they create more flexible level of remote sensing that can operate even closer to the sites and monuments than the conventional aerial data collection discussed in previous session. Alongside its many advantages and opportunities, the use of UAV comes with range of disadvantages from safe operation to data management.

In this on-site session (weather permitting), we will discuss how drones and photogrammetry are transforming archaeological exploration and heritage conservation. This session will also highlight the use of drones for site mapping, monitoring and preserving cultural landscapes. (This session will take place at Greenwich Park with details provided in Week 3).

Week 5: Laser scanners and LIDAR —application of active sensors for 3D documentation, monitoring and conservation (AR and KEP)

This session will be divided into two segments.

1. You will explore the transformative role of laser scanners and LIDAR in capturing detailed 3D representations of objects and landscapes. Discover how these technologies are crucial in the fields of archaeology, architecture and environmental studies for documentation, monitoring and conservation.
2. You will have the opportunity to discuss with the co-ordinator the course assessment and deliver a short presentation on a preliminary component of your assessed portfolio and invite feedback from fellow students.

Week 6: Reading Week – no classes.

Week 7: Landscape-level data visualisation and GIS (GA).

This session will be divided into two segments.

1. You will explore some of the most powerful and intuitive tools used by heritage practitioners to analyse spatial data (e.g. heritage site location and the broader landscape) and inform broad scale observations, namely Geographic Information Systems (GIS). A variety of increasingly open access GIS platforms, including QGIS, Google Earth Pro and Google Earth Engine, are used regularly in the archaeology sector and are now an integral part of the digital heritage skillset.

   This session will:

   - Demonstrate the different ways in which GIS is used in heritage (data collection, visualisation, analysis, reporting and integration in public policy)
   - Introduce basic GIS terms (from file types to data properties)

- Provide entry-level practical training in data import, visualisation and analysis using QGIS and Google Earth Pro
- Introduce a range of open access spatial datasets (satellite imagery, aerial photographs, digital elevation models) and associated online training material
- Foster important conversations on the biases, ethics and politics of digital spatial data collection and analysis.

2. You will have the opportunity to discuss with the co-ordinator the course assessment and deliver a short presentation on a preliminary component of your assessed portfolio and invite feedback from fellow students.

Week 8: Digitisation of conventional records, archives and historical collections, and ethical considerations.

Archaeology and heritage management are disciplines that are based on long tradition of creating records. Archaeological archives and monument records are extensive sources to rely on for research and management heritage in any part of the world. But most of them exists in conventional or 'analogue' forms – based on paper, film or glass negatives, tape, or similar – and represent varying degrees of fragility. Issues of access, lack of searchability and metadata hamper their usability. Therefore, turning them into digital formats is a priority for many organisations and several large-scale projects exist at our Institution to that end too. However, digitisation is not a simple process of scanning and storing the data, but a complex set of steps and measures that turns information on physical carriers into a digital information that is usable by many stakeholders and different software packages for many different goals. We will discuss approaches and key concepts in this area. The session will also address a broader question: What happens to the collections after digitisation and how the issues of ethics are addressed in this area? Does the digitisation and documentation mean the end of a lifecycle of the records? These questions will set the beginnings of discussions of ethics in digital heritage in general.

Week 9: Curating the data: Long-term sustainability and Open data.

Creating the digital data in its different forms from different sources, and even making it usable via different platforms does not necessarily guarantee long-term preservation of data. The loss and corruption of digital data is a major issue, and curating the data is critical in order to benefit from it for managing heritage in the longer term. What are the approaches to making digital data sustainable? Is it about making data carriers sustainable and formats interoperable, or is it something more complex? How institutional policies should address the risk management in this area? These are increasingly pertinent questions in the age of 'big-data' and heritage related datasets have some unique sensitivities that increases the need for considerate and planned approaches.

From simple data that is 'thrown' into the internet to materials under Creative Commons licenses, we will also have an overview of modern approaches to open data. This will provide us with an opportunity to return to the issue of data formats and long-term operability of the data.

Week 10: Digital recording of objects, Crowdsourcing and benefitting from recent advances of information technologies.

Recording objects in archaeological and museum context represent certain unique

challenges and the session will start by looking at those based on examples. Using detailed recording and collection of additional data for informing conservation decisions is becoming a norm for many institutions and this is an exciting new area where developments are combining several aspects of the digital documentation and presentation to a great effect.

The second part of the session will look at strategies of using existing information technologies and networks for supporting digital data collection, curation and dissemination. Among other aspects, we will be looking at crowdsourcing.

Additionally, the session will look at broader issues of ethics in the use of digital data and its implications for reconstruction based on a digital record, copyright, authenticity, etc.

Week 11: Conclusions and review (Including discussions on "AI", our digital footprint and our 'heritage' in born-digital version).

This will be an overall summary of the course and a detailed discussion of its main messages. We will return to the themes of lectures and seminars and readdress the areas that may need additional discussion. This is also a session to address some of the major issues over authorship and ethics in the digital world. Additionally, we will look at 'Digital heritage' from another angle: What happens to a digital footprint that we create? What about the works and outputs that only exist in digital format? Is it a 'heritage' and if so, how to cater for it?