

# MSc Computational Archaeology: GIS, Data Science and Complexity

Handbook, 2023–2024

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Moodle: <https://moodle.ucl.ac.uk/course/view.php?id=39813>

**Please refer to the IoA Student Handbook** for a wide range of information about studying at the UCL Institute of Archaeology, including: expectations of students; progression, award and classification; assessment; extenuating circumstances and reasonable adjustments; student support and wellbeing; and many other topics.

**Please refer to section 12 of the IoA Student Handbook and the IoA Study Skills Guide** for instructions on coursework submission, IoA referencing guidelines and marking criteria, as well as UCL policies on **penalties for late submission, over-length work and academic misconduct**.

<https://www.ucl.ac.uk/archaeology/current-students/ioa-student-handbook>

<https://www.ucl.ac.uk/archaeology/current-students/ioa-study-skills-guide>

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## 1 Introduction

Welcome to the MSc *MSc Computational Archaeology: GIS, Data Science and Complexity*, the Institute of Archaeology and University College London. This handbook outlines the aims and objectives, structure and content of the degree, and includes outlines of the core courses and the most relevant options available this year.

This Handbook should be used alongside the [Institute of Archaeology Student Handbook](#) and the [Institute of Archaeology Study Skills Guide](#). These provide essential information on a range of topics including the following:

- Introduction to key staff, facilities and resources at the Institute of Archaeology and at UCL;
- Course enrolment and attendance requirements;
- Presentation of coursework, word length regulations;
- Citing of sources, use of Turnitin and avoidance of academic misconduct (plagiarism);
- Submission of coursework and penalties for late and over-length coursework;
- Granting of extensions for extenuating circumstances;
- Marking criteria for coursework and dissertations;
- Planning and writing dissertations;
- Student feedback and representation;
- Disabilities.

Other important information for students is provided on the UCL website (<https://www.ucl.ac.uk/students/>). If you have queries about the organisation, objectives, structure, content or assessment of the degree, you should consult the Degree Coordinator.

## 2 Aims, objectives and learning outcomes of the degree

Leading archaeological researchers and heritage professionals use a raft of computational methods including GIS, data mining, web science, ABM, point-process modelling and network analysis. To impress employers you need the flexibility to learn on the job, leverage open data and program open source software, and increasingly these are also essential skills for doctoral research. This MSc draws on UCL's unparalleled concentration of expertise to equip you for future research, or to significantly enhance your employability.

The **aim** of this degree is to help you become a theoretically aware and technically proficient end-user of a range of quantitative and computational tools that are available for archaeological research and heritage management.

The principal **objectives** are that having completed the programme you will be able to:

- Critically assess research publications and reports which report on the use of quantitative and computational methods;

- Determine whether the assumptions that underly the use of particular methods (such as GIS algorithms, prospection methods, data mining techniques, agent based modelling, etc.) are appropriate to a particular problem;
- Make informed decisions about the collection and acquisition of data for quantitative analysis and undertake that analysis using a strong inferential framework;
- Make competent practical use of a variety of computational tools provided by both industry-standard and open-source software;
- Undertake some programming to extend existing or create new functionality for archaeological purposes.

In meeting these objectives you will also be able to demonstrate the following generic **learning outcomes**:

- An understanding of the importance of scale, agency and causal flow in explanation;
- An understanding of the effective use of models for scientific inference;
- The ability to use quantitative data to support an argument;
- The ability to formulate and carry through a research design;
- The application of acquired knowledge;
- The ability to solve technical problems;
- Oral presentation skills;
- Independence in learning.

### 3 Programme structure

The programme of study for this degree is intended to help you meet the objectives outlined above, and also to provide an opportunity for you to achieve any additional personal objectives. It comprises **two compulsory core courses** worth 15 credits each, **four courses which students choose from a range of options**, again worth 15 credits each, and a **dissertation** worth 90 credits. Note that each 15 credit course contributes 1/12 of your overall degree result, while the dissertation contributes 1/2 of your overall result.

Each course addresses a specific subject and has its own Coordinator (who may or may not be the Degree Coordinator). Note also that each course has its own—more detailed—handbook, which may be found on the Institute website (<http://www.ucl.ac.uk/archaeology/study/graduate-taught/courses>) and by following the link to the relevant courses on the *MSc Computational Archaeology* Moodle site (<https://moodle.ucl.ac.uk/course/view.php?id=39813>). Note that the 2023/24 handbooks may not appear on these websites until the start of term. Please consult the Degree Coordinator if you are unable to access the *MSc Computational Archaeology* Moodle site.

### 3.1 Core courses

Effective use of quantitative and computational methods requires a combination of background knowledge, theoretical understanding and technical ability. Consequently you are expected to participate in the following two 15 credit core courses (collectively worth 2/12 of the degree):-

**ARCL0160 Archaeological Data Science** introduces principles of information science and its application to archaeology. The areas covered include database management and design, basic principles of computer languages and scripts, use of computational modelling methodologies in archaeological problems, crowd sourcing, and basic design of broader computer applications and apps for smart phones and other devices. The course is intended to provide a basic understanding in core principles and practical application on how emerging technologies and methods can be applied to archaeological problems.

**ARCL0161 Complexity, Space and Human History** will provide an overview of concepts and techniques that underpin a model-based approach to the study of spatial organisation and long-term unfolding of human history. The course will cover scales of analysis, structure and causality in complex socio-natural systems, network analysis, evolutionary approaches to the study of cultural change, the role of simulation in contemporary science and modern approaches to spatial patterning.

### 3.2 Options

You must take a further four optional courses (collectively worth a total of 60 credits or 4/12 of the degree). There is considerable flexibility, but students should choose *at least two* of the following:-

**ARCL0087 Exploratory Data Analysis in Archaeology** provides training in the application of multivariate statistical methods to archaeological data .

**ARCL0094 GIS in Archaeology and History** provides training in the representation and manipulation of spatial information using GIS.

**ARCL0095 GIS Approaches to Past Landscapes** This course builds on the prerequisite module *GIS in Archaeology and History* (ARCL0094) to provide students with a theoretical grounding and practical experience in advanced uses of Geographic Information Systems for archaeological purposes. There is a strong emphasis on the manipulation of raster data and we consider landscape geomorphometry, viewshed analysis, cost surface analysis, hydrology, as well as 2.5D and 3D modelling, and Internet GIS.

**ARCL0103 Spatial Statistics, Network Analysis and Human History** further investigates the properties of spatial data and provides the skills required to draw reliable conclusions from spatial analysis.

**ARCL0143 Geophysical Survey in Archaeology** includes a detailed examination of the main geophysical survey techniques: Earth Resistance survey, magnetometry, Ground Penetrating Radar and magnetic susceptibility. Lab-based exercises in the processing of geophysical survey data and their incorporation into a GIS system are provided using TerraSurveyor and QGIS. A two-day field class at Verulamium, the Roman city at St Albans, Hertfordshire, is run during reading week.

**ARCL0148 Digital Heritage: Applications in Heritage Management** introduces students to the latest developments in the use of digital technologies for management of heritage across the world. Among other things, the course teaches 3-dimensional recording techniques with a focus on cheap and rapid tools for comprehensive modelling, analysis and monitoring of heritage sites, and subsequent integration of the data into GIS and virtual environments (VR).

Students who do not choose all their options from the above list may instead take one or two others from the [wide range of Masters courses the taught in the Institute of Archaeology](#) (subject to timetabling and the availability of places).

Alternatively, it may be possible (again, subject to timetabling and the availability of places) to take one 15 credit option course provided by another Department at UCL, or one of the other Colleges of the University of London. In recent years students at the Institute of Archaeology have taken courses offered by the Department of Civil, Environmental and Geomatic Engineering and the Department of Information Studies, notably:-

**CEGE0043 Web and Mobile GIS.** See the [relevant entry in the UCL module catalogue for details](#).

You should **discuss your option choices with the Degree Coordinator** and you must confirm your initial choice of options on Portico by the module registration deadlines, which will be emailed to you by the Student Records Team.

### 3.3 Dissertation

The dissertation of up to 15,000 words is a report on research, the topic chosen being approved as being relevant within the general area covered by this degree (it should include a practical component). Soon after arrival, you should discuss your area of research interest with your Degree Coordinator, who will help you to focus your ideas for your dissertation, or refer you to another member of staff who will be able to provide more specific advice, and will probably be appointed to be your **Dissertation Supervisor**. They will help the you define your dissertation topic, and provide guidance through the main stages of the work. The dissertation provides a further opportunity to define and achieve a your own particular objectives. It might be used to apply newly learned approaches to an archaeological problem that has long been of interest, or to gain greater experience with particular spatial analytic methods. If you are studying part-time while working in the field, you might choose to analyse a data set derived from your own work, or to assess the potential of computer-based spatial analytic methods for your work. You can treat the dissertation as a one-off research project, as a pilot study for a PhD project, or use it to showcase your skills to potential employers.

The **dissertation should be submitted by 1st September 2024**. General guidelines for researching, writing and producing the dissertation are linked from [Chapter 9 of the Institute of Archaeology Study Skills Guide](#).

Advice on the preparation of the dissertation will be provided at sessions at regular intervals through the year, starting at the Masters Student Induction Days.

### 3.4 Prerequisites

One of the *MSc Computational Archaeology* courses has prerequisites: *ARCL0095: GIS Approaches to Past Landscapes* requires that students have taken or are taking *ARCL0094: GIS*

in *Archaeology and History*, or have acquired equivalent knowledge and skills by other means. In addition, students who have not taken *ARCL0160: Archaeological Data Science* may be asked to take an extra class providing an introduction to scripting using the Python programming language in order to help them prepare for one of the assessments. Part time students should pay attention to these prerequisites when choosing which courses to take in the first year.

You will have been accepted to the programme on the understanding that you already have sufficient background in archaeology, anthropology or a relevant field, either through your previous degree, or through relevant experience, to be able to follow the programme and modules for which you have been accepted. If, however, you wish to change their programme, or the modules in which you indicated an interest in when you applied, you should discuss this with the relevant Degree and Module Coordinators.

In some cases, depending on your previous background, it may be recommended that you also attend (but will not be assessed for) a parallel undergraduate lecture course, to ensure that you have the background to get the most out of the Masters level seminars.

## 4 Teaching schedule

Taught courses are normally timetabled in the first two terms, although assessed work may be scheduled for submission in the third term, depending on which options have been selected. Each term is 11 weeks long, but in general no teaching is scheduled in the sixth week, which is known as 'Reading Week'. Term 1 fills most of October–December and Term 2 fills most of January–March. You are expected to use the remaining months to work on your dissertation.

Students studying for the degree on a part time basis will be expected to take at least three courses (which should include two core courses) in the first year and the remainder in the second. Part time students must agree their choice of courses with the degree coordinator. They may start work on their dissertation at the same time as full-time students, or they may wish to start later; either way they should consult the degree coordinator.

Full details of the timetable for each course are included in the relevant course handbook, but here is a summary of the principal courses associated with the *MSc Computational Archaeology*.

### Term 1

Mon	14:00-16:00	IoA 322c	ARCL0161 Complexity, Space and Human History
Wed	09:00–12:00	IoE 427 lab. 3	ARCL0094 GIS in Archaeology and History
Thu	11:00–14:00	IoA 322c	ARCL0160 Archaeological Data Science
Fri	13:00-15:00	IoA 322c	ARCL0087 Exploratory Data Analysis. . .

### Term 2

Tue	11:00–13:00	IoA 612	ARCL0148 Digital Heritage
Wed	10:00–13:00	IoA 322c	ARCL0095 GIS Approaches to Past Landscapes
Thu	16:00-18:00	IoA 322c	ARCL0103 Spatial Statistics, Network Analysis. . .
Fri	13:00-15:00	IoA 322c	ARCL0143 Geophysical survey in archaeology

## 5 Teaching methods

The core and option courses for this degree programme generally use a mix of lectures, seminars and laboratory-based practicals. Lectures and seminars help students grasp the principles of specific methods which they will then explore in laboratory-based practical classes.

## 6 Method of assessment

This varies from course to course, but is always set out in the relevant course handbook. The courses most relevant to the MSc Computational Archaeology typically require you to submit a written essay and evidence of practical work using relevant software. The nature and deadlines of individual assessments are defined in the course outline documents for the individual courses, available from the relevant Course Coordinator, or on Moodle. If you are unclear about the nature of an assignment, you should contact the Course Coordinator. The Course Coordinator will normally be willing to discuss an *outline* of your approach to the assessment, provided this is planned suitably in advance of the submission date.

## 7 Learning difficulties and disabilities

If you have dyslexia, any other learning difficulty, or a disability, please see the information about reasonable adjustments in [Chapter 7 of the Institute of Archaeology Student Handbook](#). Please also discuss with your lecturers whether there is any way in which they can help you. Students with dyslexia are reminded to indicate this on each piece of coursework.

## 8 Coursework

Detailed guidance on the production and submission of coursework can be found in [Chapter 12 of the Institute of Archaeology Student Handbook](#) and the [Institute of Archaeology Study Skills Guide](#).

Please note that there are **penalties for late and over-length coursework, and for academic misconduct including plagiarism and unauthorised use of text generation software such as ChatGPT**. In some circumstances these penalties can be severely detrimental to your degree result, so **if in doubt or difficulty always seek guidance from a relevant member of staff**, such as the Course Coordinator, Degree Coordinator, Masters Tutor or Institute of Archaeology Academic Administrator.

## 9 Oral examination

All Master's students are required to attend an oral examination, normally as part of their Dissertation assessment. This will normally be held in late May or early June. You must submit to your Dissertation Supervisor and degree programme coordinator a single sheet of A4 summarising the proposed research design of your dissertation to which you will speak. The oral examination will be conducted by the degree coordinator and the Dissertation Supervisor(s) and will normally last for c. 20 minutes (inclusive of the student presentation and



a questioning session). This may be organised with a group of students giving their presentations with their peers present. In such cases, following the presentation each student will have a meeting with their Dissertation Supervisor to discuss further their Presentation and Dissertation programme. No marks are awarded for the oral examination; the assessment is satisfactory or unsatisfactory. In the event of a problem being identified by the examiners of the Dissertation, you may be invited to attend a formal viva voce examination with the External Examiner for the degree also in attendance. Part-time students and students on two-year MA programmes will normally be required to give a Dissertation presentation (viva) in the year in which they are examined in the Dissertation.

## 10 Degree classification

The Board of Examiners normally meets in Late October or early November. At that time students who have completed all elements may be recommended for the award of a degree. Degree results will be classed as a Distinction, Merit, Pass or Fail. The requirements for each classification are described in [Chapter 11 of the Institute of Archaeology Student Handbook](#). Candidates who fail to pass in one or more elements (course or dissertation) should consult the Degree Coordinator and/or the Institute of Archaeology Academic Administrator, Judy Medrington.

Note that each 15 credit course contributes 1/12 of the overall mark, while the dissertation contributes 6/12.

## 11 Communication

The primary channel of communication within the Institute of Archaeology is e-mail. If you wish to be contacted on your personal or work e-mail address, please arrange for e-mail sent to your UCL address to be forwarded to your other address, since staff and other students will expect to be able to reach you through your College e-mail, which they can find on the UCL web-site.

It is also essential that you sign up on Moodle for the modules you are taking. This is essential so you can access the handbooks for the courses, obtain copies of the seminar presentations and the reading lists, submit your coursework, and as a forum for discussion. Course Coordinators also use it as the primary means of communicating information about the modules.

## 12 Attendance

UCL expects students attend all the scheduled learning events which appear on their timetable as this maximises the chance of academic success. Additionally, under UK immigration laws, UCL is required to report to UK Visas and Immigration (UKVI) when an overseas student has not been engaging with their studies. See [Chapter 5 of the Institute of Archaeology Student Handbook](#) for more information.

Consequently, registers will be taken at all classes. If you are unable to attend a class, please email the course coordinator to explain, in order to ensure that there is a record of the reasons for your absence.

You should also be aware that potential employers seeking references often ask about attendance and other indications of reliability.

## 13 Libraries and other facilities

### 13.1 Libraries

In addition to the Library of the Institute of Archaeology (5th floor), other libraries in UCL with holdings of particular relevance to this degree programme are the Science Library (D.M.S. Watson building on the central UCL site), the Environmental Studies Library in Wates House on Gordon Street, and the [Department of Geography Map Library](#). A full list of UCL libraries and their opening hours is provided at <http://www.ucl.ac.uk/library/>.

There are three Institute of Archaeology subject guides which you may find useful:

- [Archaeology](#);
- [Egyptology](#);
- [Cultural Heritage & Museum Studies](#).

The [University of London libraries](#) also have holdings which may be relevant to this degree programme.

### 13.2 Archaeological GIS and Computing Laboratory

Most practical sessions will be held in the Archaeological GIS and Computing (AGIS) Laboratory, located in room 322c on the third floor of the Institute, the Digital Heritage Laboratory also on the third floor, or the Institute of Education 427 Lab. 3. located at 20 Bedford Way, WC1H 0AL. The AGIS laboratory is administered by the [IoA IT Team](#) with input from relevant academic staff.

The laboratory contains 10 networked workstations. These computers have Intel core i9-10940X CPUs, 128Gb RAM, nVidia RTX 5000 GPUs, 27 inch 4K monitors, and are running Windows 10. They have range of GIS and other software installed. All access filespace on the UCL file servers and they can also be used to access central UCL Microsoft Windows (Desktop@UCL) and Sun Microsystems SunOS services.

You may use these facilities whenever the Institute building is open and the laboratory is not required for teaching.

Please be sure to **save your work on the network drive** (typically x:) since work stored here will be accessible from other workstations in the lab. and indeed off-campus via [Desktop@UCL Anywhere](#), and is backed-up by UCL. Files saved on the local C: drive are only available from the workstation you were logged into at the time, are not backed-up and may be deleted without warning!

## 14 Health and safety

The Institute has a Health and Safety policy and code of practice which provides guidance on laboratory work, etc. All work undertaken in the Institute is governed by these guidelines and students have a duty to be aware of them and to adhere to them at all times. This is particularly important in the context of the laboratory/field work which will be undertaken as part of this degree. Further information is provided in [Chapter 22 of the Institute of Archaeology Student Handbook](#).

## 15 Feedback

In trying to make this degree as effective as possible, we welcome feedback during the course of the year. You will be asked to fill-in Progress Forms at the end of each term, which the degree coordinator will discuss with you, which include space for comment on each of your courses.

At the end of each course all students are asked to give their views on the course in an anonymous questionnaire, which will be circulated at one of the last sessions of the course. These questionnaires are taken seriously and help the course coordinator to develop the course. The summarised responses are considered by the degree coordinator, the Institute's Staff-Student Consultative Committee, Teaching Committee, and by the Faculty Teaching Committee.

If you are concerned about any aspect of a specific course, we hope you will feel able to talk to the relevant course coordinator, but you they feel this is not appropriate or have more general concerns, you should consult your Degree Coordinator or the Masters Tutor (Jeremy Tanner). You may also consult the Academic Administrator (Judy Medrington), the Chair of Teaching Committee (Louise Martin), or the Director (Kevin MacDonald).

## 16 Staff

The Degree Coordinator is:

**Prof. Mark Lake** (ML)

Tel: 020 7679 1535

Email: [mark.lake@ucl.ac.uk](mailto:mark.lake@ucl.ac.uk)

The principal contributors to the core courses and most frequently chosen options are:

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