1 OVERVIEW

Short description
This course introduces principles of information and data science and its application to archaeology. The areas covered include basic principles of computer languages and scripts, database management and design, web science and design, data mining, photogrammetry, crowdsourcing, and 3D modelling. All of these will also reinforce computational methodologies in addressing archaeological problems. 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. The course is intended to give students skills that allow them to apply computational methods for their own research and professional interests. Lectures will cover how these techniques have been used in archaeology and other fields, including benefits and limitations. The course will also utilize hands on training and practicals to reinforce methods and techniques taught.

Week-by-week summary

SCHEDULE
(Fridays 11:00-1:00 Term I in AGIS IoA)

6 October 2017          Session 1          M. Altaweel
Introduction
Introduction to Programming

13 October 2017          Session 2          M. Altaweel
Understanding Object-Oriented Programming
Designing Programmes

20 October 2017          Session 3          M. Altaweel
Polyglot and Multi-Paradigm Computing
Assignment 1 due date:
Turnitin deadline: 27 October 2017 (midnight)
Hardcopy deadline: 27 October 2017, 5 pm

Assignment 2 due date:
Turnitin deadline: 17 November 2017 (midnight)
Hardcopy deadline: 17 November 2017, 5 pm

Assignment 3 due date:
Turnitin deadline: 15 December 2017 (midnight)
Hardcopy deadline: 15 December 2017, 5 pm

Project due date:
Turnitin deadline: 12 January 2018 (midnight)
Hardcopy deadline: 12 January 2018, 5 pm

Methods of assessment
This course is assessed by three short assignments (60% of the total mark) and one research project (40%).

This course is assessed by means of:
(a) *The three* pieces of coursework will be posted on Moodle, with each being 450-550 words, which each contribute 20% to the final grade for the course.
(b) These assignments are evaluated by 1) how well you employ your work to accomplish the specified task, 2) how well you commented and understood what you were doing, 3) how easily your work is portable and works on different computers, 4) how well you use concepts discussed in class.
(b) a research project with between 3,325-3,675 words. The criteria is the same as the assignments and you must be able to demonstrate that your project can address a useful archaeological problem.

Note: all assignments are likely to include coding. Details will be discussed in class, as code should be submitted for evaluation.

**Teaching methods**
The course is taught through one hour lectures/seminars and one hour of hands on practical lessons during class. Each week will include presentations on concepts and presentation of examples that demonstrate concepts. In addition, students are expected to spend time outside of class to review materials.

**Workload**
Total work will constitute about 150 hours. This includes 20 hours for lecture, 20 for reading, 20 for additional work on practicals, and 90 hours for assignment preparation.

2 AIMS, OBJECTIVES AND ASSESSMENT

**Aims**
The aim is to introduce students to key concepts in data/information science as it applies to archaeology. With increased use of technologies and increasing availability of data and data repositories, archaeologists need techniques and methods to understand how to promote their work in a modern format to other researchers and the public, while also utilizing information to make new and deeper understanding into archaeological problems. This includes being aware of current technical tools that are available as well as having abilities to customize tools to solve problems of interest.

**Objectives**
On successful completion of this course a student should:

- Understanding basic software and computer science application
- Recognise how to configure and create tools for research needs
- Be able to apply tools to archaeological problems
- Be familiar with different computing methods that can be created for various research problems

**Learning Outcomes**
On successful completion of the course students should be able to demonstrate/have developed:

- A basic understanding of fundamentals in data management, scripts and software creation, web applications, photogrammetry, 3D modelling, and other computational skills
- Be able to create a basic design and practical implementation of software and technical approaches to archaeological problems

The three assignments provide assessment of the core skills taught. The research project allow students to think creatively and apply skills to a research problem specific to their interests or of relevance.

**Coursework (if applicable)**

**Assessment tasks**

*Assignment 1:* This will look at basic coding practices covered in class. The exact assignment is posted on Moodle.
Assignment 2: This will look at database and data management and data mining techniques. The assignment will be posted on Moodle.

Assignment 3: This assignment covers the creation and placement of images on websites. The assignment will be posted on Moodle.

Due dates for all assignments and project are listed above.

Project: For the project, I want you to choose an archaeological topic and choose an appropriate set of methods covered in class. These methods should at least cover one or more topics, including: databases, web scraping, website creation, photogrammetry, 3D modelling, and/or crowdsourcing.

If students are unclear about the nature of an assignment, they should discuss this with the Course Co-ordinator. Students are not permitted to re-write and re-submit essays in order to try to improve their marks. However, students may be permitted, in advance of the deadline for a given assignment, to submit for comment a brief outline of the assignment. The Course Co-ordinator is willing to discuss an outline of the student's approach to the assignment, provided this is planned suitably in advance of the submission date.

Weekly Outline

Week 1

Introduction
Introduction to Programming

Mark Altaweel

Summary: Basic concepts of modern computing and computer programming are given, including variables, methods, loops, and logical structures. The idea will also be to introduce students to the basics of Python as a language utilizing the concepts introduced. These skills will be foundational to skillsets taught in this and other courses where programming is central.

Readings

Concepts of Computing

Essential:


Suggested:


Python Resources

https://docs.python.org/3/tutorial/
http://www.pythonlearn.com/ (Chapters 2-6)
See:  https://www.python.org/about/gettingstarted/
See:  https://developers.google.com/edu/python/
See:  https://www.codecademy.com/learn/python

Week 2

Understanding Object-Oriented Programming
Designing Programmes

Mark Altaweel

Summary: Taking the lessons from the previous week, we now begin to understand how to use object-oriented frameworks to create simple to more complex computing tasks. We also go over the principal of designing computer programs. This will include documentation, modular design, and using flow charts to describe programs.

Readings

Computer Program Design

Essential:

https://scotch.io/bar-talk/s-o-l-i-d-the-first-five-principles-of-object-oriented-design

Suggested:

Object Oriented Programming


Python

https://www.tutorialspoint.com/python/python_classes_objects.htm

Week 3

Polyglot and Multi-Paradigm Computing

Mark Altaweel

Summary: This week introduces concepts in polyglot and multi-paradigm computing. The intent is to help create programmes with multiple languages (e.g., Python and R) or different paradigms (e.g., object-oriented, procedural programming, etc.). This allows us to harness other programs and their capabilities as well as create potentially more extensive software for applications, taking advantage of the strengths of each approach or platform.
Readings

Multi-paradigm Computing

Required:

Multi-paradigm Computing

See: The Role of Programming Paradigms in the First Programming Courses: http://elib.mi.sanu.ac.rs/files/journals/tm/21/tm1122.pdf

Polyglot Programming


Suggested:

Multi-paradigm Computing


Polyglot Programming


Polyglot in Python with R

http://rpy2.readthedocs.org/en/version_2.7.x/

Polyglot in Python and java

http://www.jython.org/

Data Science

Week 4

Databases
Data Mining

Mark Altaweel

Summary: This week introduces different types of databases and data mining techniques. This includes NoSQL- and SQL-based or relational databases. Data mining techniques commonly used, including classification, clustering, statistical, and artificial intelligence techniques are introduced.
Readings

Relational Databases


Required:


NoSQL Databases

Dayley, Brad. 2015. *Sams Teach Yourself NoSQL with MongoDB in 24 Hours.* Indianapolis, Ind.: Sams.

Data Mining


Suggested:

NoSQL Databases


General Scientific Background


Data Mining:


Databases

https://www.mongodb.com/
https://www.mysql.com/
https://www.sqlite.org/

Week 5

NoSQL Databases
Data Mining

Autumn 2016

Mark Altaweel
**Summary:** This week continues from the previous week, with discussion and exercises on advanced data mining techniques utilized. The intent is to look at how statistical or machine learning methods can facilitate knowledge discovery. NoSQL databases are also covered.

**Readings**

*Data Mining*

**Required:**


**Suggested:**


**Data mining tools:***


**Week 6**

*Introduction to Web Science*

*Web/Document Scraping*

Mark Altaweel

**Summary:** This week we begin to look at web science today and how it impacts archaeology and web development. The focus will be on web scraping methods for finding relevant documents and extracting key texts for further analysis from structured and unstructured data.

*Introduction to Web Science*

**Required:**


*Web/Document Scraping*


Web scraping tools:
Week 7

PDF Document Scrapping and Analysis

Mark Altaweel

Summary: We continue with document scrapping this week, where we now apply this to get information from unstructured pdf documents. The intent for this week is to allow you to potentially search and extract information from academic and other sources of information.

Required:

See reading from previous week.

Week 8

Databases and Web Design

Mark Altaweel

Summary: This week we begin to look at web design and modern web pages, including their design and interface with mobile phones. We will look at the use of web design (as a way to encourage more interactive and dynamic sites. We also introduce how designs can be developed using new software and skillsets already learned; HTML 5 and CSS will be introduced, with JavaScript and Python tools introduced.

Web Design

Required:


Suggested:


Web Development Tools

https://realpython.com/blog/python/flask-by-example-part-1-project-setup/

http://jinja.pocoo.org/

Week 9

Crowdsourcing
Autumn 2016

Chiara Bonacchi

**Summary**: We introduce the concept of crowdsourcing and how it has increasingly been used for information management, ideation processes and funding in the humanities. We also consider how it has been applied to archaeology specifically, while learning some basic tools that can be used to create new open data and/or enhance existing ones, and to evaluate volunteer contributions and their value to individuals and organisations in contemporary society.


**Crowdsourcing Tools**

[https://github.com/nytlabs/hive](https://github.com/nytlabs/hive)
[https://github.com/MicroPasts](https://github.com/MicroPasts)

**Week 10**

**Developing Apps**

Mark Altaweel

**Summary**: This week we look at deploying programs for archaeological applications. This includes mobile devices and desktops. The intent is to know how we can begin to use our own applications in a way to facilitate our research and share it with others.

**Required:**


**App Creation in Python**

[https://kivy.org/#home](https://kivy.org/#home)
[https://pybee.org/project/projects/tools/briefcase/](https://pybee.org/project/projects/tools/briefcase/)
ADDITIONAL INFORMATION

Libraries and other resources
Identify those libraries in UCL and beyond which are particularly relevant to this course, and any museums or other institutions which are regularly used in the teaching of this course.

In addition to the Library of the Institute of Archaeology, other libraries in UCL with holdings of particular relevance to this degree are: XXX

Information for intercollegiate and interdepartmental students
Students enrolled in Departments outside the Institute should obtain the Institute’s coursework guidelines from Judy Medrington (email j.medrington@ucl.ac.uk), which will also be available on Moodle.

Health and safety (if applicable)
The Institute has a Health and Safety policy and code of practice which provides guidance on laboratory work, etc. This is revised annually and the new edition will be issued in due course. 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/placement work which will be undertaken as part of this course. Expand as appropriate.

The page below should be pasted in at the end of every Core Course handbook. For other courses, please paste in the paragraph at the end of this document.
APPENDIX A: POLICIES AND PROCEDURES 2017-18 (PLEASE READ CAREFULLY)
This appendix provides a short précis of policies and procedures relating to courses. It is not a substitute for the full documentation, with which all students should become familiar. For full information on Institute policies and procedures, see the IoA Student Administration section of Moodle: https://moodle.ucl.ac.uk/course/view.php?id=40867
For UCL policies and procedures, see the Academic Regulations and the UCL Academic Manual: http://www.ucl.ac.uk/srs/academic-regulations ; http://www.ucl.ac.uk/academic-manual/

GENERAL MATTERS
ATTENDANCE: A minimum attendance of 70% is required. A register will be taken at each class. If you are unable to attend a class, please notify the lecturer by email.
DYSLEXIA: If you have dyslexia or any other disability, please discuss with your lecturers whether there is any way in which they can help you. Students with dyslexia should indicate it on each coursework cover sheet.

COURSEWORK
LATE SUBMISSION: Late submission will be penalized in accordance with current UCL regulations, unless formal permission for late submission has been granted.
The UCL penalties are as follows:
• The marks for coursework received up to two working days after the published date and time will incur a 10 percentage point deduction in marks (but no lower than the pass mark).
• The marks for coursework received more than two working days and up to five working days after the published date and time will receive no more than the pass mark (40% for UG modules, 50% for PGT modules).
• Work submitted more than five working days after the published date and time, but before the second week of the third term will receive a mark of zero but will be considered complete.

GRANTING OF EXTENSIONS: Please note that there are strict UCL-wide regulations with regard to the granting of extensions for coursework. You are reminded that Course Coordinators are not permitted to grant extensions. All requests for extensions must be submitted on a the appropriate UCL form, together with supporting documentation, via Judy Medrington’s office and will then be referred on for consideration. Please be aware that the grounds that are acceptable are limited. Those with long-term difficulties should contact UCL Student Disability Services to make special arrangements. Please see the IoA website for further information. Additional information is given here http://www.ucl.ac.uk/srs/academic-manual/c4/extenuating-circumstances/

RETURN OF COURSEWORK AND RESUBMISSION: You should receive your marked coursework within one month of the submission deadline. If you do not receive your work within this period, or a written explanation, notify the Academic Administrator. When your marked essay is returned to you, return it to the Course Co-ordinator within two weeks. You must retain a copy of all coursework submitted.

CITING OF SOURCES and AVOIDING PLAGIARISM: Coursework must be expressed in your own words, citing the exact source (author, date and page number; website address if applicable) of any ideas, information, diagrams, etc., that are taken from the work of others. This applies to all media (books, articles, websites, images, figures, etc.). Any direct quotations from the work of others must be indicated as such by being placed between quotation marks. Plagiarism is a very serious irregularity, which can carry heavy penalties. It is your responsibility to abide by requirements for presentation, referencing and avoidance of plagiarism. Make sure you understand definitions of plagiarism and the procedures and penalties as detailed in UCL regulations: http://www.ucl.ac.uk/current-students/guidelines/plagiarism

RESOURCES
MOODLE: Please ensure you are signed up to the course on Moodle. For help with Moodle, please contact Charlotte Frearson (c.frearson@ucl.ac.uk)
APPENDIX TO BE INCLUDED AT THE END OF EVERY COURSE HANDBOOK, EXCEPT THOSE FOR CORE COURSES, WHICH SHOULD INCLUDE THE PAGE ABOVE INSTEAD

INSTITUTE OF ARCHAEOLOGY COURSEWORK PROCEDURES
General policies and procedures concerning courses and coursework, including submission procedures, assessment criteria, and general resources, are available on the IoA Student Administration section of Moodle: https://moodle.ucl.ac.uk/course/view.php?id=40867. It is essential that you read and comply with these. Note that some of the policies and procedures will be different depending on your status (e.g. undergraduate, postgraduate taught, affiliate, graduate diploma, intercollegiate, interdepartmental). If in doubt, please consult your course co-ordinator.

GRANTING OF EXTENSIONS: Note that there are strict UCL-wide regulations with regard to the granting of extensions for coursework. Note that Course Coordinators are not permitted to grant extensions. All requests for extensions must be submitted on a the appropriate UCL form, together with supporting documentation, via Judy Medrington's office and will then be referred on for consideration. Please be aware that the grounds that are acceptable are limited. Those with long-term difficulties should contact UCL Student Disability Services to make special arrangements. Please see the IoA Student Administration section of Moodle for further information. Additional information is given here http://www.ucl.ac.uk/srs/academic-manual/c4/extenuating-circumstances/