



## DEPARTMENT OF HISTORICAL STUDIES

### **AE1052 3D Data and Visualization in Archaeology and Cultural Heritage Studies, 15 credits**

3D data och visualisering inom arkeologi och kulturarvstudier, 15 högskolepoäng  
*First Cycle*

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#### **Confirmation**

This course syllabus was confirmed by Department of Historical Studies on 2023-04-19 to be valid from 2023-08-28, autumn semester of 2023.

*Field of education:* Arts 50% and Science 50%

*Department:* Department of Historical Studies

#### **Position in the educational system**

*Main field of studies*

Archaeology

*Specialization*

G1N, First cycle, has only upper-secondary level entry requirements

#### **Entry requirements**

General entrance requirements.

#### **Learning outcomes**

On successful completion of the course the student will be able to

*Knowledge and understanding*

produce their own 3D data in line with best practice guidelines

know how to use visualisation and post-processing techniques for research, publication, and outreach

understand the theoretical and ethical implications of the production and use of 3D data

*Competence and skills*

discuss the relevance of 3D data for research projects, publications, and outreach projects

analyse artefacts, sites, and landscapes using 3D applications, visualisation tools, and 3D data

*Judgement and approach*

analyse and discuss the advantages and disadvantages of 3D data

evaluate the quality of 3D data

identify research problems in archaeology and cultural heritage studies that can be solved using 3D data

**Course content**

The course introduces students to the theory and methods of creating and using 3D models in archaeology and cultural heritage. The teaching will be hands-on with students creating their own models. The course will acquaint students with techniques like laser scanning, photogrammetry, 3D modelling, etc. that can be used by archaeologists and cultural heritage professionals alike. The skills learned here are transferable, and can be used by individuals in other fields and by those interested in creating 3D data. Furthermore, problems with 3D modelling and how visualization techniques can help to enhance research and outreach will be discussed. Another aspect of the course will be an introduction to the critical use of models. The course will also serve as an introduction to the wider field of Digital Archaeology - a rapidly expanding field with a growing scope, literature, and job opportunities. Since the course focuses on transferable skills, the teaching offers long-term sustainability for the participants. The course will be open to international students and will be given in English. There will be two course moments.

*Sub-courses*

**1. Acquisition of 3D data – Collection and use** (*Ackvisition av 3D data - Avhämtning och användning*), 7.5 credits

Grading scale: Excellent (A), Very good (B), Good (C), Satisfactory (D), Sufficient (E) and Fail (F)

This part of the course deals with different methods of creating 3D models of artefacts, heritage sites, and cultural landscapes. It will teach students different techniques through practical work in the field. They will learn to collect 3D data of landscapes, like ancient shorelines, barrows, rock art and archaeological materials

in cooperation with museums and the private sector. Another aspect will be the usability of 3D recording methods to engage in Public Archaeology, especially with photogrammetry. This course moment will also introduce the students to handling, analysing, and using the data in accordance with best practice guidelines. A critical outlook on 3D data will be included and the students will be introduced to general theories of digital archaeology. After this course moment, students will be able to acquire 3D data, formulate appropriate research questions, and understand their data in a critical manner. The methods taught in this course moment are: Photographic methods - including Structure from Motion and Reflectance Transformation Imaging, Laser Scanning, LiDAR, Image stacking. The course will include field moments in Gothenburg and Västra Götaland as well as study visits to museums and other public and private heritage institutions.

**2. Visualization of 3D models -theory and method** (*Visualisering av 3D models - teori och metod*), 7.5 credits

Grading scale: Excellent (A), Very good (B), Good (C), Satisfactory (D), Sufficient (E) and Fail (F)

This part of the course deals with the visualization opportunities of 3D models to enhance the collected data for research, dissemination, and public outreach. It will begin with the general theory on human vision and perception and the way this affects the use of 3D data. Afterwards, the students will learn to use several techniques for the visual enhancement of the collected data. This will again be a hands-on approach to learning. This course moment will teach students to reflect on the way they transform and manipulate data, and to foster a critical approach to their own work with 3D data. The teaching will also include discussion about how the visualizations can be used not just for research, but also for public engagement. The methods taught in this course are D-Stretch, GIS-aided approaches (i.e. Local Relief Modelling, Red Relief), and 3D reconstruction of objects, sites, and landscapes (construction and texturing in 3ds Max, Substance, Unreal). In addition, the students will be introduced to more advanced data modelling techniques such as Agent-Based Modelling and Artificial Intelligence approaches.

**Form of teaching**

The course will be taught with lectures, method training exercises, seminars, and study visits.

*Language of instruction:* English

To foster international participation in line with the Policy for Internationalisation (Dnr V 2014/474) at the University of Gothenburg, the course will be taught in English.

**Assessment**

The course is examined through individual project work including a written description, methods, work steps, analysis, and critical reflection. In the seminars, small groups will present a small, self-created projects that includes the use of 3D data.

If a student, who has failed the same examined element on two occasions, wishes to change examiner before the next examination session, such a request is to be submitted to the department in writing and granted unless there are special reasons to the contrary (Chapter 6, Section 22 of Higher Education Ordinance).

In the event that a course has ceased or undergone major changes, students are to be guaranteed at least three examination sessions (including the ordinary examination session) over a period of at least one year, though at most two years after the course has ceased/been changed. The same applies to work experience and VFU, although this is restricted to just one additional examination session.

### **Grades**

The grading scale comprises: Excellent (A), Very good (B), Good (C), Satisfactory (D), Sufficient (E) and Fail (F).

### **Course evaluation**

Students have the opportunity to evaluate the course. The result and any changes in the course structure should be communicated to both the students who completed the evaluation and to the students who will start the course.