Sanisera Archaeology Institute for International Field Schools

Course 063: GIS, LiDAR, Bathymetry and Underwater Archaeology to Reconstruct the Ancient Harbours of Menorca

Course Syllabus · 2027 season

Course ID	SAI 063 · Ancient Harbours of Menorca: GIS, LiDAR and Bathymetry
Country / Location	Spain · Headquarters of the Institute, Ciutadella de Menorca; coastal sites of Sanitja, Cala Pregonda, Cala Tamarells and Ses Fontanelles
Dates	July to August 2027 (2 sessions of 16 days)
Duration	16 days per session
Instructional hours	80 hours: 11 course days x 6.5 h + presentation day (3.5 h) + final presentations day (5 h)
Recommended credit equivalence	4 semester credits (reference scale: about 20 instructional hours per semester credit; 80 h = 4, 100 h = 5, 120 h = 6). Credit is awarded by the student's home institution; see section 12.
Level / Prerequisites	Introductory / intermediate. No previous knowledge of archaeology, software or diving is required.
Language of instruction	English
Maximum enrolment	6 students per session
Tuition	from USD 2,600 per session (see section 14)
Instructors	Fernando Contreras Rodrigo (Course Director); Adrián Fernández Sánchez (Instructor in GIS and remote sensing); Esther Fernández Colomo (GIS analyst and instructor)
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1. Program description

A laboratory and coastal-survey course on maritime archaeology without diving. Students reconstruct the ancient shape of four harbours and anchorages of Menorca (the harbour of Sanitja, Cala Pregonda, Cala Tamarells with Ses Llanes, and Ses Fontanelles in Algaiarens) by combining GIS, LiDAR, bathymetry, aerial and satellite imagery, Claude AI and the data of the underwater Archaeological Chart of Menorca, and then verify the results on the ground.

The starting point is the GIS project on the underwater archaeology of Menorca published by F. Contreras and A. Fernández in Virtual Archaeology Review 13(27), 2022. In each case study the course carries out its own bathymetric survey from a kayak, with an echo-sounder with built-in GPS and an RTK GNSS receiver, producing a digital model of the seabed that is joined to the LiDAR of the land to reconstruct the ancient coastline.

2. Course objectives

- To teach GIS, LiDAR, DEM and satellite remote sensing applied to coastal and maritime archaeology.
- To train students in low-cost bathymetric survey and the processing of soundings.
- To teach the integration of land and seabed data to reconstruct ancient coastlines.
- To introduce AI tools in the organisation and analysis of archaeological data.
- To assess the archaeological potential of harbour sites for future survey and excavation.

3. Learning outcomes

On successful completion of the course, students will be able to:

- Build a GIS project for a coastal site with bathymetry, wind, wave, current, cartographic and orthophoto layers.
- Pre-process LiDAR data and detect anomalies; produce digital elevation models.
- Plan and execute a kayak bathymetric survey with echo-sounder and RTK GNSS; process the soundings into a seabed model with 0.5 m contours.
- Produce orthophotos and photogrammetric models from drone images.
- Reconstruct the coastal palaeoenvironment around 1000 BC from LiDAR and DEM.
- Ground-truth digital anomalies in the field and interpret the territory of a harbour.
- Write a study diary and a viability report and present it orally.

4. Course format and instructional hours

The course takes place at the Institute's headquarters in Ciutadella, with short early-morning field trips and bathymetric outings (finishing by 10.30 a.m.) on calm-sea days, followed by guided laboratory work in the same morning. The working day is 6.5 hours, held in the morning. Of the 16 days, Day 1 is the formal presentation (3.5 h), 11 are course days, Day 16 is devoted to the final presentations and assessment (5 h) and 3 are rest days: 80 instructional hours (11 x 6.5 h + 3.5 h + 5 h).

Total instructional hours: 80 hours. This figure appears on the Certificate of Completion and on the Student Evaluation Report.

5. Course schedule

Indicative daily schedule; the order of activities may change according to weather, site conditions and research needs.

Day	Activities
Day 1	Arrival, orientation and Code of Conduct. Formal presentation of the programme, the laboratory and the four case studies (3.5 h).
Days 2-6	Morning sessions (6.5 h). Technology week: GIS (QGIS/ArcGIS), LiDAR pre-processing, DEM, photogrammetry, satellite imagery and Google Earth Engine, Claude AI; GIS project of each case study; lecture: seafaring and ancient harbours of Menorca.
Day 7	Rest day.
Days 8-10	Morning sessions (6.5 h): field trips and bathymetric survey (early morning) Sanitja, then Cala Pregonda; laboratory processing of soundings the same day; coastal palaeoenvironment reconstruction.
Day 11	Rest day.
Days 12-14	Morning sessions (6.5 h): bathymetry and ground-truthing at Cala Tamarells and Ses Fontanelles (conditions permitting); integration of seabed and LiDAR models; viability reports.
Day 15	Rest day.
Day 16	Final presentations, assessment and certificates (5 h, morning). Departure.

6. Assessment and grading

Students complete three assignments during the course, in addition to daily supervised work: a daily field journal, the course's recording sheets and a final presentation. The final grade is calculated as follows:

Component	Weight	Description
Field / laboratory participation and professional conduct	40 %	Daily assessment by the instructors of engagement, technique, care of the record and of the finds, teamwork and compliance with the Code of Conduct.
Daily field journal	20 %	A written entry for every instructional day describing the work

Component	Weight	Description
		carried out, the methods applied, the contexts or materials handled and the student's own observations. Reviewed weekly.
Recording sheets	20 %	Survey record forms (one per outing: lines, control points, conditions) and the GIS attribute tables; study diary. Assessed for accuracy, completeness, terminology and legibility.
Final presentation	20 %	A 10-minute PowerPoint presentation, delivered on the last instructional day, on the viability report of one of the four case studies, followed by questions.

Grading scale

Letter grade	Percentage
A	93-100
A-	90-92
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D	60-69
F	below 60

Grades are recorded as a percentage and as a letter grade on the US scale above. Students who request it receive a Student Evaluation Report signed by the Course Director, with the breakdown of the grade, the attendance record and the instructional hours completed, for submission to their home institution. The Institute does not itself award academic credit.

7. Attendance policy

Attendance at all scheduled instructional activities is compulsory. A minimum attendance of 85 % of the instructional hours is required to pass the course and to receive the Certificate of Completion. Absences for documented illness or injury are excused but still count towards the 85 % threshold; unexcused absences lower the participation grade. Students who leave the course early receive a certificate stating only the hours actually completed.

8. Prerequisites and who should apply

None. Own laptop compulsory. Students taking part in the kayak survey must be able to swim (life jackets compulsory). Minimum age 18.

9. Instructors

Fernando Contreras Rodrigo — Course Director. Licenciatura in History, specialisation in Classical Archaeology (Autonomous University of Barcelona). Five-year degree officially recognised in Spain at Master's level (MECES 3). Director of the Sanisera Archaeology Institute; since 1993 he has directed research, conservation and heritage-management projects in Spain, Italy and the United Arab Emirates, and since 2015 annual excavation and restoration missions for the Government of Dubai. Author of more than thirty publications and reports.

Adrián Fernández Sánchez — Instructor in GIS and remote sensing. PhD in Climatology and flood hazards; degree in Geography (2014). Professor of Remote Sensing at the Complutense University of Madrid. Has worked with Sanisera since 2018 in Carthage (Tunisia), Dubai (UAE), Menorca and Saudi Arabia; supervisor of Master's theses on LiDAR detection of archaeological remains and geostatistics.

Esther Fernández Colomo — GIS analyst and instructor. Archaeologist specialised in Geographic Information Systems (Complutense University of Madrid), trained in drone photogrammetry and machine learning applied to GIS. GIS technician for the Sanisera Archaeology Institute in Dubai (2025-2026); co-author of three scientific publications.

10. Equipment and what to bring

- Own laptop (compulsory).
- Light field clothing, water shoes, hat, sunscreen, water bottle; swimwear and towel for bathymetry days.
- Notebook; passport; health insurance.

11. Travel and meeting point

Fly to Menorca (Mahón, MAH). Students travel on their own to the Student Residence in Ciutadella (bus or taxi, approx. 45 minutes); public buses approx. EUR 30, taxi approx. EUR 75; on the arrival day the Institute offers a private minibus from the airport for about EUR 30-40 in cash. The address and arrival instructions are sent two weeks before the course. Meeting point: the residence, on Day 1 at 6 p.m.

Students arriving from outside the Schengen area should check whether they need a visa; the Institute issues the letter of invitation required for the application. US, Canadian, UK and Australian citizens do not need a visa for stays of up to 90 days in Spain; they will need the EU ETIAS travel authorisation once it comes into force (no start date has been fixed yet; the Institute will inform admitted students). If a Schengen visa is refused, everything paid is refunded in full on presentation of the official refusal document.

12. Academic credit and transcript

The Sanisera Archaeology Institute is an independent, non-profit institution and does not award academic credit directly. Students who wish to receive credit for this course should obtain pre-approval from their department or study-abroad office before the course begins, using this syllabus. On completion, the Institute issues a Certificate of Completion stating the course, dates, instructional hours and final grade, and, on request, a detailed Student Evaluation Report. Students from universities in the United States, Canada, the United Kingdom and Australia have regularly obtained credit for Sanisera courses in this way: students from more than 40 universities have done so (see the list on the Institute's website). The Institute is currently working towards a School of Record agreement with a US accredited institution for the issue of official transcripts.

13. Code of conduct and safety

All students and staff are bound by the Institute's Code of Conduct and Anti-Harassment Policy, available on the website, which applies at the site, in the laboratory, in the accommodation and during free time. A safety briefing is given on the first day; students may decline any activity they consider unsafe. Serious breaches of the Code may lead to removal from the course without refund. Accident insurance at the site is included; students are responsible for their own health and travel insurance.

14. Dates, tuition and what is included

Session	Dates 2027	Tuition (USD)
1	14-29 July	$ 2,600
2	1-16 August	$ 2,600

Tuition includes

- Tuition and teaching.

- Transport on field-trip days from the headquarters to the four sites.
- Accident insurance for the fieldwork.
- Accommodation in the Institute's student residence in the center of Ciutadella (rooms shared by students of the same sex, air conditioning, wifi; cooking not allowed).
- Certificate of completion and, on request, the Student Evaluation Report.
- Letter of invitation for the Schengen visa, if required.

Not included

- Airfare from the student's home to/from Menorca (Spain).
- Meals (budget approx. EUR 23 per day; cafés and restaurants recommended by the Institute).
- Personal expenses and optional travel insurance.

Payment. A deposit of USD 450, which is part of the tuition and is deducted from the total, reserves the place and is due within five days of admission; the balance is due 60 days before the session begins. Payment plans are available on request. The Institute does not offer scholarships or discounts.

Refund policy. If the student cancels, only the USD 450 deposit is refunded, and only if the refund is requested within 20 days of paying it; the balance is not refundable, but everything paid can be converted into credit for any course in the current year or the following season. Everything paid is refunded in full if the Institute cancels the session or if the student's Schengen visa is refused (official refusal document required). Places are not transferable. Full text: Terms and Conditions of Payment on the website.

15. Recommended readings

Recommended, not required. Readings are available in the Institute's library during the course.

- Contreras, F. & Fernández, A. (2022). GIS applied to the underwater archaeology of Menorca. Virtual Archaeology Review, 13(27).
- Conolly, J. & Lake, M. (2006). Geographical Information Systems in Archaeology. Cambridge: Cambridge University Press.
- Opitz, R. S. & Cowley, D. C. (eds.) (2013). Interpreting Archaeological Topography. Oxford: Oxbow.
- Blackman, D. J. (1982). Ancient harbours in the Mediterranean. International Journal of Nautical Archaeology, 11(2-3).
- Bowens, A. (ed.) (2009). Underwater Archaeology: The NAS Guide to Principles and Practice. 2nd ed. Oxford: Blackwell.

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