"Program to support the socio-economic recovery in the protected area of Shobak castle"
AICS Project GIORDANIA AID 12253/01/1

Training Course Title:

MANAGING, SHARING AND DISSEMINATING ARCHAEOLOGICAL AND
ARCHITECTURAL HERITAGE WITH COMPUTER SCIENCES

Brief Description of the course:
Issued by appointed trainers from the University of Florence (Italy),
the course will comprise frontal lectures, workshops/practicum, and a personal project/assignment. Frontal lectures and workshops will primarily focus on architectural survey and building archaeology methodologies, as well as computer sciences employed for managing, sharing, and disseminating archaeological and architectural heritage.

- **ARCHAEOLOGY OF ARCHITECTURE (Chiara Marcotulli):**
  The class will deal with the principles of methodologies for the study of historic buildings and will provide the trainees with the tools to interpret the architectures in their context, starting from material evidence. After a brief introduction on the history of the discipline, the topics will focus on the methodological elements, in order to analyse the specificities of stratigraphy applied to the study of architecture. Themes relating to the production processes of historic buildings will then be covered, analysing technological aspects as building materials and tools, and focusing on how to recognize the archaeological indicators of the Medieval yard. The final part of the course will provide the educational elements for interpreting architectures (classification, typologies, and chronologies). Some lessons will be dedicated to practical activities on the Medieval buildings of the Shobak castle, such as stratigraphic readings, documentation and data recording.

- **ARCHITECTURAL SURVEY / 3D MODELLING (Lapo Somigli):**
  In direct continuity with the stratigraphic analysis of architecture, this course will focus on the survey and graphic documentation of architecture; this is a requirement of any stratigraphic analysis: to obtain a reliable and accurate representation of the object studied.
  After a theoretical part on surveying methodologies (direct and indirect) and the characteristics a survey must have, we will use the most common surveying instruments and techniques: total station, laser scanner and photogrammetry. Some lessons will be practical, at Shobak Castle, and each participant will be able to actively participate in the construction of the survey.
  In the classroom we will process data in order to build a three-dimensional model of an architectural structure. We will talk about data formats (open and not), data interoperability between different software and the integrated use of data from different instruments (laser scanner, total station, photogrammetric images).
  Finally, we will use the 3D model to obtain the traditional representations of an architectural structure (plan, elevations, sections) and we will prepare the model for further research needs, related to the communication of results and their dissemination.

- **COMPUTER SCIENCES (PIERRE)**:
  Utilizing architectural 3D models developed previously, this course will introduce students to tools and techniques for publishing and disseminating their work. It will encompass theoretical concepts concerning data formats, graphic adjustments, error management, and precision using open-source software for 3D data management. Fundamental aspects of 3D modeling, meshing, color theory, and texture application will be explored through the utilization of open-source tools such as Meshlab and Cloud Compare.

  Subsequently, the course will transition to a second phase, focusing on the web publication of these 3D models, presenting them either as point clouds or within virtual reality environments using UNITY. Students will receive templates and will work directly on the architectural surveys of the Shobak castle that they have previously realized. This approach enables them to independently generate visualizations and publish their findings. Furthermore, students will utilize the Python programming language and generative AI software ChatGpt to enhance their understanding and capabilities in this domain.

Main goals of the course:

Acquiring competencies in utilising key methodologies related to architectural surveys and building archaeological analyses, as well as computer science as a support for archaeological research, with particular emphasis on managing, sharing, and disseminating historical-archaeological heritage.

Acquired competences:

Surveying building contexts in the field and processing collected data through digital analysis.

Developing skills in reading and interpreting masonry stratigraphies based on modern stratigraphic approaches, particularly from a light archaeology perspective.

Utilising computer science tools to enhance archaeological research and manage and disseminate historical-archaeological heritage.

Trainers brief biography:

- <u>Chiara Marcotulli</u>: holds a PhD in Medieval Archaeology and is president of Laboratori Archeologici San Gallo, a spin-off company of the University of Florence. She is a member of the Italian archaeological mission "Medieval Petra". From 2014 to 2020 she was adjunct professor of Light Archaeology at the School of Specialization in Archaeological Heritage of the University of Florence and in 2022/2023 she was adjunct professor of Archaeology of post-classical architecture at the Department of Cultural Heritage of the University of Padua. She is scientific coordinator in commercial archaeology investigations in Italy and she is responsible for projects of landscape archaeology, excavation and archaeology of architecture since 2008. Her research interests are in the Middle Ages' material culture with a specific focus on archaeological analysis of architectures.

- Lapo Somigli: is a medieval archaeologist, specialized in IT application for historical and archaeological research. Member of the Italian archaeological missions "Medieval Petra" and "The Making of the Silk Road in Armenia" (University of Florence), where he is in charge of the three-dimensional surveys of artefacts, excavations and architectural structures. He is also adjunct professor of Geomatics Laboratory at the School of Specialization in Archaeological Heritage and of Digital Humanities at SAGAS Department (University of Florence). From 2018 to 2023 PhD Somigli has been research fellow at University of Florence within an interdisciplinary project on digital humanities; now he is research fellow for HAI Mobility Project (University of Florence).

- Pierre Drap. Research Fellow at CNRS in section 07, Computer Science, he works at the LIS Laboratory, Laboratory of Computer Science and Systems, at the University of Aix-Marseille, France. He specialises in 3D surveying by photogrammetry applied to archaeology and his research focuses on the link between 3D surveys and knowledge representation. He holds a PhD in Computer Science (1997) and an Accreditation to Supervise Research (Habilitation à Diriger des Recherches, a high-level French degree that authorises the holder to supervise PhD students) in Mathematics-Computer Science in 2013.