

COURSE OF STUDY *Physics (LM-17)*

ACADEMIC YEAR 2024-2025

ACADEMIC SUBJECT *Applied physics to cultural heritage*

General information	
Year of the course	1st
Academic calendar (starting and ending date)	2nd semester: March – May 2025
Credits (CFU/ECTS):	3
SSD	FIS/07
Language	English
Mode of attendance	Recommended, not compulsory

Professor/ Lecturer	
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Department and address	Dipartimento Interateneo di Fisica “M.Merlin”, Campus Universitario, via Amendola 173 – 70125 Bari, room R46
Virtual room	
Office Hours (and modalities: e.g., by appointment, on line, etc.)	By appointment (mail), room R46

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
75	16	15	44
CFU/ECTS			
3	2	1	

Learning Objectives	Overview of the physics techniques applied to cultural heritage and possible connections with other disciplines
Course prerequisites	Notions of atomic, nuclear and sub-nuclear physics, particle detectors

Teaching strategie	
Expected learning outcomes in terms of	
Knowledge and understanding on:	Basic knowledge of the techniques applied to cultural heritage
Applying knowledge and understanding on:	Ability to autonomously recognize the techniques and procedures in this field;
Soft skills	Making informed judgments and choices <ul style="list-style-type: none"> ● In discussing and comparing the main techniques currently in use; Communicating knowledge and understanding <ul style="list-style-type: none"> ● ability to present and to discuss the applications with an appropriate scientific language

	<p>Capacities to continue learning</p> <ul style="list-style-type: none"> ● ability to approach the specialist literature and to work in an international and multidisciplinary context
Syllabus	
Content knowledge	<p><i>Micro-analytical tools in physics. Principles of Radiography, X-Ray Absorption, and X-Ray Fluorescence, TAC. Examples of applications: from Leonardo da Vinci to Vermeer's painting technique. Particle Induced X-Ray Emission (PIXE), applications in Art & Archaeology. Raman spettroscopy. IR reflectology.</i></p> <p><i>Dating with Radioactive Clocks. Radiocarbon Dating Method. Thermoluminescence.</i></p> <p><i>Basic notions of radiometric geochronology. The age equation. Radioactive decay chains. Simple parent-daughter pairs. The Rb-Sr method. The K-Ar system: K-Ar dating. ⁴⁰Ar and ⁴⁰K counting. Chronology of evolution. Uranium Thorium dating, analyzing techniques.</i></p> <p><i>Neutron Tomography. Neutron Activation Analysis (NAA). Neutron Activation of paintings. The Qumran scrolls. A case study: was Napoleon murdered? NAA responds!</i></p> <p><i>Isotope Separation and Analysis for provenance studies. Food and Diet analysis. Fractionation. Viking Food.</i></p> <p><i>Detectors: HPGe, High Purity Germanium Detector for gamma rays. Setup for thermoluminescence. Silicon detector.</i></p>
Texts and readings	<i>Slide and scientific articles.</i>
Notes, additional materials	
Repository	

Assessment	
Assessment methods	
Assessment criteria	<ul style="list-style-type: none"> ● Knowledge and understanding of the basic aspects of the content of the course ● Applying knowledge and understanding <ul style="list-style-type: none"> ○ Ability to autonomously recognize and discuss the main aspect of the course ● Autonomy of judgment <ul style="list-style-type: none"> ○ Ability to evaluate the conceptual accuracy of the physics equations and models. ● Communicating knowledge and understanding <ul style="list-style-type: none"> ○ Ability to discuss one's knowledge with appropriate scientific language ● Communication skills <ul style="list-style-type: none"> ○ Ability to discuss the general contents of the course ● Capacities to continue learning <ul style="list-style-type: none"> ○ Ability to deepen specific topics of physics to cultural heritage autonomously starting from the knowledge and methods acquired during the course;
Final exam and grading criteria	<i>The ability to explain the various concepts and the level of understanding of the same will be positively evaluated</i>
Further information	