



General information		
Academic subject	Applied physics to cultural heritage	
Degree course	Physics	
Academic Year	I	
European Credit Transfer and Accumulation System (ECTS)		3
Language	English	
Academic calendar (starting and ending date)	February 2023 - May 2023	
Attendance	No	

Professor/ Lecturer	
Name and Surname	Francesco Barile
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Telephone	
Department and address	<i>Dipartimento Interateneo di Fisica "M.Merlin", Campus Universitario, via Amendola 173 - 70125 Bari, room R46</i>
Virtual headquarters (Microsoft Teams code)	
Tutoring (time and day)	Always available on request, in presence (room R46)

Syllabus	
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 detector
Contents	<p>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 &amp; Archaeology.</p> <p>From the atom to the nucleus. Basic principles of Nuclear physics. Radioactive decay law. How many radioactive K-40 atoms are in your body system? let's calculate it! Dating with Radioactive Clocks. Radiocarbon Dating Method. C-14 not only for Cultural Heritage! Thermoluminescence.</p> <p>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. 40-Ar and 40-K counting. Chronology of evolution. Uranium Thorium dating, analyzing techniques. Neutron Activation Analysis (NAA). NAA for plastic explosive search. Neutron Activation of paintings. The Qumran scrolls. Was Napoleon murdered? NAA responds! Isotope Separation and Analysis for provenance studies. Food and Diet analysis. Fractionation. Viking Food.</p>
Books and bibliography	
Additional materials	

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
<b>Hours</b>			
75	31		44
<b>ECTS</b>			
3			



<b>Teaching strategy</b>	
	Class lectures
<b>Expected learning outcomes</b>	
Knowledge and understanding on:	<ul style="list-style-type: none"><li>• Basic knowledge of the techniques applied to cultural heritage</li></ul>
Applying knowledge and understanding on:	<ul style="list-style-type: none"><li>• Ability to autonomously recognize the techniques and procedures in this field;</li></ul>
Soft skills	<ul style="list-style-type: none"><li>• <b>Making informed judgments and choices</b><ul style="list-style-type: none"><li>○ In discussing and comparing the main techniques currently in use;</li></ul></li><li>• <b>Communicating knowledge and understanding</b><ul style="list-style-type: none"><li>○ ability to present and to discuss the applications with an appropriate scientific language</li></ul></li><li>• <b>Capacities to continue learning</b><ul style="list-style-type: none"><li>○ ability to approach the specialist literature and to work in an international and multidisciplinary context</li></ul></li></ul>
<b>Assessment and feedback</b>	
Methods of assessment	
Evaluation criteria	<ul style="list-style-type: none"><li>• <b>Knowledge and understanding</b><ul style="list-style-type: none"><li>○ of the basic aspects of the content of the course</li></ul></li><li>• <b>Applying knowledge and understanding</b><ul style="list-style-type: none"><li>○ Ability to autonomously recognize and discuss the main aspect of the course</li></ul></li><li>• <b>Autonomy of judgment</b><ul style="list-style-type: none"><li>○ Ability to evaluate the conceptual accuracy of the physics equations and models.</li></ul></li><li>• <b>Communicating knowledge and understanding</b><ul style="list-style-type: none"><li>○ Ability to discuss one's knowledge with appropriate scientific language</li></ul></li><li>• <b>Communication skills</b><ul style="list-style-type: none"><li>○ Ability to discuss the general contents of the course</li></ul></li><li>• <b>Capacities to continue learning</b><ul style="list-style-type: none"><li>○ Ability to deepen specific topics of physics to cultural heritage autonomously starting from the knowledge and methods acquired during the course;</li></ul></li></ul>
Criteria for assessment and attribution of the final mark	The ability to explain the various concepts and the level of understanding of the same will be positively evaluated
<b>Additional information</b>	