UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Fisica e Chimica - Emilio Segrè
ACADEMIC YEAR	2019/2020
MASTER'S DEGREE (MSC)	CULTURAL HERITAGE CONSERVATION AND RESTORATION
SUBJECT	CHEMICAL-PHYSICAL RESEARCH METHODOLOGIES
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50684-Scienze e tecnologie per la conservazione e il restauro
CODE	16598
SCIENTIFIC SECTOR(S)	CHIM/02
HEAD PROFESSOR(S)	CHILLURA MARTINO Professore Ordinario Univ. di PALERMO DELIA FRANCESCA
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	102
COURSE ACTIVITY (Hrs)	48
PROPAEDEUTICAL SUBJECTS	01900 - GENERAL AND INORGANIC CHEMISTRY
MUTUALIZATION	
YEAR	3
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**CHILLURA MARTINO** **DELIA FRANCESCA** Monday 15:00 16:00 Studio Prof. Chillura. Ed. 17 - Viale delle Scienze

DOCENTE: Prof.ssa DELIA FRANCESCA CHILLURA MARTINO

PREREQUISITES	Principles of chemistry: elements and compounds, chemical bounds, intermolecular interactions. Principles of classical physics: electromagnetic waves.
LEARNING OUTCOMES	Knowledge and ability to understand the physical principles at the ground of the iradiation-matter interaction determining the functioning of the morphological and structural characterization techniques; ability to understand the scientific language of non-destructive and microinvasive physical chemistry. Students must develop skills related to the use of analytical methods to provide answers to questions posed by conservation and restoration issues. Students must be able to identify the problem to be studied and select the appropriate techniques to obtain relevant and valid results. Evaluate autonomously the application difficulties and the advantages resulting from the use of investigative techniques designed to characterize the materials for the proper design of restorations of different substrates. Demonstrate the ability to integrate knowledge and manage complexity, and make judgments based on limited and incomplete information, integrating them by scientific literature and by designing additional experiments. Students must be able to: - Expose the basic concepts relating to the physical principles governing the techniques of analysis; To expose the basic concepts of the Chemistry of Cultural Heritage, integrating them with the concept of interaction with the environment; - to be able to communicate clearly and without ambiguity, even to non-expert interviewees, their conclusions and knowledge; - to deepen the topics through scientific articles on specific subject in an autonomous and individual way and to follow seminars and insights into the field of diagnostics applied to Cultural Heritage.
ASSESSMENT METHODS	The assessment of student learning is to ensure both the possession of the skills and knowledge of the subjects covered by the teaching and the ability to include them in application projects in the field of the preservation and restoration of artifacts of historical artistic interest. In addition, it evaluates the possession of adequate technical-scientific dictionary and exposure skills. Student assessment is performed by oral exam, covering the topics of the course. The final evaluation expressed in thirtieth, will be formulated as follows: 1) Basic knowledge of the topics covered and limited ability to elaborate acquired knowledge, correlation with specific application aspects for the correct conservation and restoration of cultural heritage. Sufficient ability to analyze the topics presented. Limited autonomy for judging and showing the procedures followed (rating 18-21) 2) Good knowledge of the topics covered and good skills in compiling the acquired knowledge, correlating with specific application aspects for the proper conservation and restoration of cultural heritage. Good ability to analyze the topics presented. Good autonomy for judging and showing the procedures followed (rating 22-24) 3) Extensive knowledge of the topics covered and more than good skills in the processing of acquired knowledge, correlation with specific application aspects for the correct conservation and restoration of cultural heritage. Good analysis of the arguments presented. Autonomy of judgment and exposure of the procedures followed more than good (rating 25-27). 4) Excellent knowledge of the topics covered, excellent skills in compiling the acquired knowledge, correlation with specific application aspects for the correct conservation and restoration of cultural heritage other than those of teaching. Excellent ability to analyze the phenomena presented. Excellent autonomy forjudging and showing the procedures followed (rating 28-30) 5) Excellent knowledge of the topics covered, excellent ability to compile acquired knowledge, correlation with specific application aspects for the correct conservation and restoration of cultural heritage other than those of teaching. Excellent ability to analyze the phenomena presented. Excellent autonomy for judging and showing the procedures followed (vote 30 and praise).
EDUCATIONAL OBJECTIVES	The course intends to give the knowledge necessary for understanding the principles on which some of the techniques used in the diagnostic of cultural goods are based, particularly regarding the non-destructive and micro-invasive techniques applied to the investigation of various materials (organic, inorganic) . Concerning the various methods of investigation presented, the fields of application, advantages, limits and some specific applications in the Field of Cultural Heritage will be indicated.
TEACHING METHODS	classroom lessons
SUGGESTED BIBLIOGRAPHY	A) P. W. Atkins. E P. de Paula ELEMENTI DI CHIMICA FISICA. Zanichelli iV Ed. 2018 B) Mauro Matteini ed Arcangelo Moles. SCIENZA E RESTAURO – Metodologie di indagine. Nardini Editore VII Ed. C) Douglas A. Skoog – James J. Leary CHIMICA ANALITICA STRUMENTALE EdiSES II Ed.

SYLLABUS

Hrs	Frontal teaching
2	Purpose and organization of the course. Exam organization. The contribution of the chemical-physical investigation in the field of Cultural Heritage
4	Principles of light-matter interaction. Radiation sources. Detectors
2	Visible, UV and IR spectrophotometries
3	Raman spectroscopy. Principles and application
3	IR spectroscopy. Principles and applications
4	Laboratory and portable IR instrumentation. Micro FT-IR (Fourier Transform IR). ATR (Attenuated total reflection)
6	Liquid state and solid state - Nuclear Magnetic Resonance Spectroscopy (NMR). Principles and applications
2	Optical microscopy. Laboratory and portable instrumentation.
4	Scanning and Transmission Electron Microscopy. Principles and applications.
2	Electron microscopy. Sample preparation (cross section, thin section, shiny section). Microtome and ultramicrotome
4	X-ray fluorescence. Principles and application. Laboratory and portable instrumentation
2	Radiography and tomography
4	Natural and induced radioactivity. Radiochemical methods. Principles and application
8	Definition of issues of interest for conservation and restoration also trough on field visits (museums, restoration yards, ...). Organization of a measure survey based on standard operating procedures. Organization of analysis reports. Critical discussion of results.