UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Fisica e Chimica - Emilio Segrè
ACADEMIC YEAR	2022/2023
MASTER'S DEGREE (MSC)	CULTURAL HERITAGE CONSERVATION AND RESTORATION
SUBJECT	CHEMISTRY OF PIGMENTS AND NATURAL SUBSTANCES
TYPE OF EDUCATIONAL ACTIVITY	A
AMBIT	50681-Formazione scientifica
CODE	15422
SCIENTIFIC SECTOR(S)	CHIM/06
HEAD PROFESSOR(S)	BRUNO MAURIZIO Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	102
COURSE ACTIVITY (Hrs)	48
PROPAEDEUTICAL SUBJECTS	01900 - GENERAL AND INORGANIC CHEMISTRY
MUTUALIZATION	
YEAR	5
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**BRUNO MAURIZIO** Tuesday 12:00 14:00 Edificio 17 Thursday 12:00 14:00 Edificio 17

DOCENTE: Prof. MAURIZIO BRUNO

PREREQUISITES	General Chemistry, Organic Chemistry
LEARNING OUTCOMES	KNOWLEDGE AND ABILITY OF COMPREHENSION. Knowledge of the structure of various natural substances in artifacts CAPACITY TO APPLY KNOWLEDGE AND COMPREHENSION Ability to determine the relationship between chemical structure of materials and suitable application of restoration and conservation methods MAKING JUDGMENTS. Being able to evaluate, by the use of analytical techniques, the chemical nature of the materials used in the manufactured articles ABILITY OF COMMUNICATION. Ability to expose the reason of the use of certain conservative and analytical technical. LEARNING CAPACITY Ability to upgrade with the consultation of its scientific publications. Ability to follow, using the knowledge acquired in the course, later teachings, regarding both the analysis of the artifacts, and a specific intervention procedure.
ASSESSMENT METHODS	The evaluation of student learning requires the possession of the skills and knowledge of the subject matter of the course as well as the ability to apply them to problems related to the restoration of a Cultural Heritage. In addition, it verifies the possession of property of scientific language and of exposure capacity. The final exam is an oral test that will focus essentially on the following topics: natural products used historically and presently in artistic artifacts, natural products used historically and currently in the protection and restoration of artistic artifacts, organic natural and synthetic dyes and pigments, inorganic pigments, spectroscopic and chemical methods for the identification of substances. The final assessment, properly graded, will be made on the basis of the following conditions: a) sufficient knowledge of subjects and theories addressed in the course; sufficient degree of awareness and autonomy in the application of theories to solve chemical problems (rating 18-21); b) Good knowledge of subjects and theories addressed in the course; fair degree of awareness and autonomy in the application of theories to solve chemical problems (rating 22-25); c) Good knowledge of subjects and theories addressed in the course; good degree of awareness and autonomy in the application of theories to solve chemical problems (rating 26-28); d) Excellent knowledge of subjects and theories addressed in the course; excellent level of awareness and autonomy in the application of theories to solve chemical problems (rating 29-30L).
EDUCATIONAL OBJECTIVES	The aim of the course is to provide the knowledge needed to understand the chemical and physic properties of natural organic compounds and materials and pigments and dyes. Such knowledge allows the student to develop the necessary scientific approach for solving conservative and restoring problems of cultural heritage artefact.
TEACHING METHODS	Teaching takes place in the first half of the fifth year and consists of lectures.
SUGGESTED BIBLIOGRAPHY	Dispense di riferimento

SYLLABUS

Hrs	Frontal teaching
4	Natural waxes. Animal waxes. Vegetable waxes. Mineral waxes.
4	Methods for the analytical investigation. Gas chromatography. Mass spectrometry
4	Methods for the analytical investigation. H and C13 NMR
4	Natural resins and lacquers. The monoterpenes. The diterpenes. Triterpenoid resins. Fossil resins. Resins from insects. Lackey.
4	Oils and fats. The fatty acids and glycerides. Drying oils. Minor components. Deteriorating organic substances: causes and prevention. Photochemical degradation. Antioxidants. Deterioration agents.
4	Textile fibers from plants and animals. Synthetic fibers.
4	Color theory. Primary colors. additive and subtractive colors. Analysis of the dyes. Spectrometry. Chromophores. Auxochromes.
4	Historical use of pigments and organic dyes. Vegetable and animal dyes and red resins. Yellow dyes and resins. Blue dyes. Mixed dyes. Browns and blacks dyes. Tannins . The decay of the dyes .
8	Synthetic organic dyes. Technical classification. Chemical classification. acid dyes, basic dyes, metal-dyes, substantive dyes, azo dyes, vat dyes, Reactive dyes, sulfur dyes, oxidation dyes, dispersion dyes.
8	Pigments: main properties. Inorganic pigments. Organic pigments : monoazo pigments, bisazo-pigments, acetarilidic pigments, naphthol derivatives, solubilizing groups , ftalocianic pigments, anthraquinone pigments, tioindigoides, azinic pigments, chinacridonic pigments, acidic pigments, basic pigments, metal complexes.