



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Fisica e Chimica - Emilio Segrè
ACADEMIC YEAR	2016/2017
MASTER'S DEGREE (MSC)	CULTURAL HERITAGE CONSERVATION AND RESTORATION
INTEGRATED COURSE	SCIENCE AND TECHNOLOGY OF MATERIALS
CODE	06328
MODULES	Yes
NUMBER OF MODULES	2
SCIENTIFIC SECTOR(S)	ING-IND/22
HEAD PROFESSOR(S)	MEGNA BARTOLOMEO Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	MEGNA BARTOLOMEO Professore Associato Univ. di PALERMO
CREDITS	12
PROPAEDEUTICAL SUBJECTS	01900 - GENERAL AND INORGANIC CHEMISTRY
MUTUALIZATION	
YEAR	3
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	MEGNA BARTOLOMEO Monday 15:00 17:00 Stanza del docente, primo piano ed. 6, stanza 115

DOCENTE: Prof. BARTOLOMEO MEGNA

PREREQUISITES	Matter structure Chemical bonds: ionic, covalent, metallic Strength and energy Aqueous solution: pH, solubility, buffer solution, redox
LEARNING OUTCOMES	<p>Knowledge and understanding: knowing microscopical and macroscopical properties of different materials and understanding the connection between them. physico chemical analysis useful in definition of conservation state of the artwork understanding the possible results of analysis; compatibility criteria between different materials.</p> <p>Applying knowledge and understanding preparing a proper diagnostic plane by choosing the right analytical technique according to the conservation state; choose the right materials according to the conservation state and proposed restoration;</p> <p>Making judgements choosing the most suitable and cheap analysis to define the conservation state; choosing the right material according to the conservation state.</p> <p>Communication Ability in communicating with specialist in diagnostic and material decay. Using a proper language to describe decay phenomena, possible causes and solutions.</p> <p>Learning skills Learning from the scientific literature, conferences or courses and keep abreast of new analytical techniques. Going deeper in comprehension of interaction between environment and materials.</p>
ASSESSMENT METHODS	Oral examination. The interview is aimed at determining the student's ability to process the knowledge gained by using them to solve problems and the ability to express the teaching content using a technically correct language. The vote is expressed in thirtieths with possible praise
TEACHING METHODS	Multimedia presentation aided front lessons; visits to the Laboratory of Materials for Restoration and Conservation of DICAM

**MODULE
MATERIAL ANALYSIS - WORKSHOP**

Prof. BARTOLOMEO MEGNA

SUGGESTED BIBLIOGRAPHY

Materiale fornito dal docente all'indirizzo <https://sites.google.com/site/bartolomegna/corsi-universitari/laboratorio-materiali>

Skoog Leary - Chimica Analitica Strumentale - Edises

Matteini Moles - La chimica nel restauro - Nardini Editore

Campanella et al. - Chimica per l'arte - Zanichelli

Volpin Apollonia - Le analisi di laboratorio applicate ai beni artistici policromi - Padova

Milazzo Ludwig - Misurare l'arte. Analisi scientifiche per lo studio dei beni culturali - Bruno Mondadori

Paolillo Giudicianni - La Diagnostica nei Beni Culturali. Moderni Metodi di Indagine - Loghia

Ciliberto Spoto - Modern Analytical Methods in Art and Archaeology - Intescience

Nota: I testi indicati costituiscono bibliografia di riferimento e la preparazione dell'esame non prevede lo studio integrale degli stessi. Gli studenti potranno scegliere tra i testi indicati in funzione delle proprie esigenze previo colloquio col docente.

AMBIT	50684-Scienze e tecnologie per la conservazione e il restauro
INDIVIDUAL STUDY (Hrs)	102
COURSE ACTIVITY (Hrs)	48

EDUCATIONAL OBJECTIVES OF THE MODULE

Knowing and understanding

Knowing the theoretical basis and practical approach to the most common analytical techniques used in the conservation of cultural heritage in order to understand the achievable results.

Knowing the mechanical behaviour of materials even by means of mechanical test.

Applying knowledges

Indicating the analysis to be provided in the restoration project.

Making judgements

Choosing the analysis that can be used to define the conservation state or the constitutive materials of a work of art. Be able in identifying the analysis used to go deeper in the knowledge of the object and the ones used to identify decay phenomena.

Communication

Ability in communicating with specialist in diagnostic and material decay.

Using a proper language to describe decay phenomena, possible causes and solutions.

Learning skills

Learning from the scientific literature, conferences or courses and keep abreast of new analytical techniques.

Going deeper in comprehension of decay phenomena to better understand interaction between environment and materials.

SYLLABUS

Hrs	Frontal teaching
4	Introduction: sampling methods, sample representativity, error theory, detection limit, resolution, sensitivity
7	Mechanical properties of materials and their measurement. Tension, compression, bending, impact and fatigue tests. Viscoelastic behaviour.
3	Thermal properties of materials: heat capacity, thermal conductivity, linear thermal expansion, thermal induced stresses
4	Water vapour permeability, capillary absorption, capillary condensation.
4	Density and porosity: liquid and gas pycnometry, mercury intrusion porosimetry, including a visit to the laboratory.
6	Optical microscopy: linear optics, lens properties, optical microscopy in polished cross sections and thin sections.
3	Scanning electron microscopy, including a visit to the laboratory.
4	Ion chromatography and XRay diffractometry in the identification of soluble salts.
3	Thermogravimetric analysis, differential thermal analysis, differential scanning calorimetry.
4	Elemental spectroscopy: XRF, LIBS, EDS in cooperation with Laboratorio di Fisica e Tecnologie Relative

**MODULE
SCIENCE AND TECHNOLOGY OF MATERIALS**

Prof. BARTOLOMEO MEGNA

SUGGESTED BIBLIOGRAPHY

Materiale fornito dal docente all'indirizzo <https://sites.google.com/site/bartolomegna/corsi-universitari/laboratorio-materiali>

Palanti S., Durabilita' del legno, Dario Flaccovio ed.

Pecchioni E., Fratini F., Cantisani E., Le malte antiche e moderne tra tradizione ed innovazione, Patron ed.

Bertolini L., Gastaldi M., Introduzione ai materiali per l'architettura, UTET ed.

AMBIT	50684-Scienze e tecnologie per la conservazione e il restauro
INDIVIDUAL STUDY (Hrs)	102
COURSE ACTIVITY (Hrs)	48

EDUCATIONAL OBJECTIVES OF THE MODULE

Knowing and understanding

Characteristics of materials used in artworks crafting, particularly wood, artificial stoney materials, textiles.

Characteristics of polymeric materials used in restoration intervention.

Understanding compatibility between materials and between materials and environment.

Applying knowledge

Choosing the right materials according to the intervention.

Identify the decay phenomena in realtion to material characteristichs.

Making judgements

Choose the right material understanding underlying compatibility factors in order to achieve a better preventive conservation.

Communication

Using the proper language with materials science specialist.

Learning skills

Learning from the scientific literature, conferences or courses and keep abreast of materials technology.

Going deeper in comprehension of material science to better understand interaction between different materials, understanding the pros and cons of new materials.

SYLLABUS

Hrs	Frontal teaching
4	Introduction: pH, chemical equilibrium, solubility, relative and absolute humidity, simplified psychrometric chart.
10	Wood: origin, structure and ultrastructure of wood cell, chemical composition, wood species, orthotropy, relation with environmental humidity, decay factors, materials for wood consolidation.
3	Gypsum: production, properties and decay phenomena, water gypsum ratio.
10	Lime: ancient and modern production method, lime based products: lime putty, hydrated lime, milk of lime, nanolime. Lime based mortars: influence of aggregates and aerial limea based hydraulic mortars.
8	Hydraulic binders: hydraulic lime, roman cement, portland cement, pozzolanic cement. Decay phenomena in concrete sctructures. Fundamentals of geopolymers.
5	Decay phenomena in artificial stoney materials: water circulation within the walls, capillarity, freeze and thaw cycles, soluble salts.
2	Synthetic polymeric materials: thermo mechanical behaviour and classification of polymers.
2	Composite materials and natural fibrous polymer.
4	Organic and Inorganic consolidation materials.