



# 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	BIOTECHNOLOGIES AND ENTOMOLOGY FOR THE CULTURAL HERITAGE		
CODE	16599		
MODULES	Yes		
NUMBER OF MODULES	2		
SCIENTIFIC SECTOR(S)	BIO/03, AGR/11		
HEAD PROFESSOR(S)	PALLA FRANCO	Professore Associato	Univ. di PALERMO
OTHER PROFESSOR(S)	MANACHINI BARBARA	Professore Associato	Univ. di PALERMO
	ROSY INES		
	PALLA FRANCO	Professore Associato	Univ. di PALERMO
CREDITS	9		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	4		
TERM (SEMESTER)	Annual		
ATTENDANCE	Not mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	<p><b>MANACHINI BARBARA</b>  <b>ROSY INES</b></p> <p>Tuesday 10:00 11:30 Viale delle Scienze, 13. Edificio 5A, stanza 004</p> <p>Thursday 10:00 11:30 Ricevimento studenti polo Trapani c/o la sede del polo di Trapani, Via del principe di Napoli e on line su richiesta.</p> <p><b>PALLA FRANCO</b></p> <p>Monday 15:00 17:00 Studio del docente, Dipartimento STEBICEF - Sez Botanica ed Ecologia vegetale, via Archirafi 38 - I piano, 90123 Palermo</p> <p>Wednesday 15:00 17:00 Studio del docente, Dipartimento STEBICEF - Sez Botanica ed Ecologia vegetale, via Archirafi 38 - I piano, 90123 Palermo</p> <p>Friday 14:00 16:00 Studio del docente, Dipartimento STEBICEF - Sez Botanica ed Ecologia vegetale, via Archirafi 38 - I piano, 90123 Palermo</p>		

DOCENTE: Prof. FRANCO PALLA

<b>PREREQUISITES</b>	The student should have the knowledge derived from academic studies with particular reference to Biology, besides being able to process the information received, critically describing the possible applications.
<b>LEARNING OUTCOMES</b>	<p>Knowledge and understanding:</p> <p>Knowledge of issues relating to the evaluation of the state of conservation status of an artworks with specific attention to the biological deterioration induced by micro-biological (bacteria, fungi) and macro (insects).</p> <p>Knowledge of the scientific literature related to the consolidation and bio-cleansing of artifacts of historical and artistic interest. Understand and evaluate the potential risks arising from the application of biotechnology for each constitutive materials and the techniques. Overview on insects and other arthropods which may cause the deterioration of artifacts of historical and artistic interest. Knowledge on the control and pest-management.</p> <p>Apply knowledge and understanding:</p> <p>Define and draw up appropriate intervention protocols that allows a non-invasive and controlled sampling, defining both time and method for each case, as well as an adequate system to control and fight microbial and entomological infestation, doing deeper the green-conservation strategy.</p> <p>Making judgments</p> <p>Evaluate the result of the identification of biodeteriogens, referring to the results of the application of innovative methodologies, or utilized in other experiences or reported in literature. Define and apply methodologies under the point of view of the sustainable restoration.</p> <p>Communication</p> <p>Report, from the initial phase the complete restoration highlighting the problems encountered and the solutions adopted in order to achieve results that meet the minimum criteria for a conservative intervention.</p> <p>Ability to use the specific terminology to interact with scientific and experts in restoration, in order to define an adequate preventive conservation or restoration strategies, for the appropriate choice of materials and instrumental investigative techniques.</p> <p>Learning skills</p> <p>Ability to implement knowledge from literature and processes aimed to the preservation or restoration of artifacts realized with different constitutive materials. Ability to apply technical and scientific knowledge, acquiring new ones, for a complete identification of biological consortia involved in biodeterioration process, or for removal of undesired ayes. To be able to participate in Master's Degree and PhDs courses.</p>
<b>ASSESSMENT METHODS</b>	<p>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 laude</p> <p>The learning is assessed through an interview. In this oral examination the student must answer to at least three questions on the topics of the course, and they have to show an adequate knowledge, acquisition of interpretative skills, capacity of connecting and processing the arguments, as well as a relevant presentation capacity. The final grade will be expressed in thirtieth and will be judged insufficient when the student will demonstrate: difficulty to focus on the proposed topics, a shallow knowledge of the arguments and extreme limited exposure ability. As the degree of details of the proven knowledge increase will proportionally increase the positivity of the grade. The maximum score is obtained in case of excellent mastery and critical-interpretative jurisdiction of the subject content of the course and a good exposition proved by the use of proper scientific terminology</p>
<b>TEACHING METHODS</b>	Front lessons complete with multimedia presentations; visits to the Laboratory of Biology and Biotechnology for Cultural Heritage of STEBICEF department

## MODULE APPLIED MOLECULAR BIOLOGY FOR THE CULTURAL HERITAGE

*Prof. FRANCO PALLA*

### SUGGESTED BIBLIOGRAPHY

Fabbri B. (2012) Science and Conservation in Museum Collecton - Nardini Editore, Firenze  
 Lorusso S. et al (2014) Risk management in the field of cultural heritage: museum, libraries, archives – MIMESI Editore, Milano  
 Tiano P. & Pardini C. (2005) LE PATINE. Genesi, significato, conservazione - Nardini Editore , Firenze  
 Saiz-Jimenez C. (2013) - Molecular Biology and Cultural Heritage, Balkema, the Netherland  
 Dispense e pubblicazioni scientifiche fornite dal docente

<b>AMBIT</b>	50687-Attività formative affini o integrative
<b>INDIVIDUAL STUDY (Hrs)</b>	102
<b>COURSE ACTIVITY (Hrs)</b>	48

### EDUCATIONAL OBJECTIVES OF THE MODULE

The course aims to deal the problems relating to the conservation of historic-artistic manufacts with specific attention to biodeterioration. In addition evaluate innovative and sustainable methods for bio-consolidation and bio-cleaning procedures. Moreover it focalize the attention on methods for direct and indirect control and to contrast the microbial colonization and entomological infestations, in according to green-conservation protocols.

The possible artefact-environment interactions will be highlighted and critically discussed, through the monitoring of chemical-physical parameters. Will also address the conservation and exposition of archaeological and waterlogged finds and the importance of the study of ancient artifacts / fossils, including the analysis of ancient DNAs. The use of bioactive molecules for the biocleaning of artworks surfaces.

## SYLLABUS

Hrs	Frontal teaching
4	Revealing and identifying biodeteriogens by means of technological protocols based on microbial DNA analysis.
2	Hypogeal environments: revealing of microbial taxa in patinas and biofilms
3	Aerosol of conservation /fruition environments, sampling (gelatine membrane) and identification go microorganisms detrimental both for cultural assets and human health.
3	Removal of coherent and incoherent layers. Biocleaning by purified enzymes or viable bacterial cells.
4	Characteristics and selective criteria of enzymes in relation to the undesired layers. Hydrolasis (amylase, esterase, lipase, protease) useful in restoration projects.
2	State of the art of enzymes for restoration of organic (paper, painting on wood or canvas) and inorganic (frescoes) manufacts
4	Different "dirt" patina detectable on artworks surface
3	Selection of experimental condition specific for enzyme application: temperature, salt condition, supports (gel, Nylon membrane).
2	Green conservation: novel biological molecules with enzymatic or biocidal activity.
2	Biocleaning by viable bacterial cells.
2	Attention and Risk indexes
4	Waterlogged findings: conservative conservation and in situ sustainable fruition
2	Ancient DNA
2	Morphological and molecular investigation on archaeological findings
4	Detection and identification of biodeteriogens through technological protocols based on the analysis of microbial DNA
3	In vitro culture: liquid and solid media of samples taken from woks of arts
2	Sample preparation and observation by scanning electron (SEM) and confocal (CLSM) microscopy

## MODULE APPLIED ENTOMOLOGY FOR THE CULTURAL HERITAGE

*Prof.ssa BARBARA ROSY INES MANACHINI*

### SUGGESTED BIBLIOGRAPHY

Articoli scientifici e materiale didattico (presentazioni PowerPoint) fornito dal docente verranno caricati sulla piattaforma Unipa.

Scientific papers and materials (PowerPoint presentations) provided by the teacher will be loaded on the platform Unipa.

Testi consigliati:

The recommended basic texts for the course are:

- Chiappini, Liotta, Reguzzi, Battisti. Insetti e Restauro. Calderini Ed agricole 2001.
- Caneva, Nugari, Salvatori: La biologia nel restauro, Nardini editore
- Fausta Gallo: Il biodeterioramento di libri e documenti, Centro studi per la conservazione della carta – ICCROM (1992)
- Materiale didattico fornito dal docente presente sulla piattaforma Unipa

<b>AMBIT</b>	50687-Attività formative affini o integrative
<b>INDIVIDUAL STUDY (Hrs)</b>	51
<b>COURSE ACTIVITY (Hrs)</b>	24

### EDUCATIONAL OBJECTIVES OF THE MODULE

This part of the course is aimed at those involved with, or responsible for, the care of objects in collections - museums, galleries, libraries, archives, historic houses, etc. Lectures/discussions focus on the theory and practice of Integrated Pest Management (IPM) and include practical sessions on recognising pest insects and insect damage and monitoring insects present in a collection (on exhibition or in store). Basic knowledge on morphology and physiology of insects that are pest of BBCC is essential to know how control them and the different methods applicable. The focus is on chemical pesticides and the importance of safe use by the operators.

The course will offer guidance on how to deal with insect pest problems likely to be encountered. The focus is on insects and the damage they cause, together with up to date information on the detection, monitoring and trapping of pests and the emphasis are on prevention as the key to successful Integrated Pest Management. The advantages and disadvantages of physical and chemical control measures are also evaluated. In addition, positive aspects on insects in the art and as materials for arts crafts and BBCC will be presented.

Major objectives of the course:

1. To introduce the main insect pests which attack BBCC - What they need to live - How to identify them - The damage they cause - Ways to prevent them becoming established.
2. To understand pest environments/habitats.
3. To consider the selection of the most appropriate treatments for controlling pests.
4. To investigate methods of establishing an Integrated Pest Management (IPM) programme
5. Positive aspect of insects

## SYLLABUS

Hrs	Frontal teaching
1	Presentation of the course and examination procedures. Evaluation of the previous knowledge.
8	Importance of insects. Insecta: origins and affinities with other arthropods. Integument system and colours. External morphology. Reproduction, eggs and ootaxis. Embryonic and postembryonic development. Moults, metamorphosis, preimaginal stages, adult. Order and major species of BBCC importance. Their biology, ecology and ethology.
4	Monitoring and different methods of control. The integrated pest Management (IPM) in BBCC
2	Alien Insect in the BBCC problems and practical issues
2	Biotechnology applied to insects pest in BBCC
2	Practical examples and curiosities also from archeo-entomology
2	Positive aspects of insects in the Cultural Heritage and of Art
3	Subject proposed by and in accordance with students found on news and related to insects and BBCC, or other subjects of their interest.