



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Fisica e Chimica - Emilio Segrè		
ACADEMIC YEAR	2018/2019		
MASTER'S DEGREE (MSC)	CULTURAL HERITAGE CONSERVATION AND RESTORATION		
SUBJECT	ORGANIC CHEMISTRY		
TYPE OF EDUCATIONAL ACTIVITY	A		
AMBIT	50681-Formazione scientifica		
CODE	01933		
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	1		
TERM (SEMESTER)	2° 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	-Knowledge of General Chemistry : (Chemical bonding , hybrid orbitals, electronegativity , acids and bases, chemical kinetics , basics of thermodynamics) . -Knowledge of Physics : Electromagnetic waves, quantization of energy
LEARNING OUTCOMES	KNOWLEDGE AND ABILITY OF COMPREHENSION Acquisition of knowledge of the structure and reactivity of organic compounds. Ability to use the specific language of this discipline CAPACITY TO APPLY KNOWLEDGE AND COMPREHENSION Ability to be able to determine the relationships between structure, physical properties and chemical reactivity of organic compounds also multifunctional. MAKING JUDGMENTS Being able to assess the implications of the use of chemical products on historical art-fact as well as the use of organic compounds in restoration procedures. ABILITY OF COMMUNICATION Ability to expose the use patterns of certain products and to highlight the negative effects of any incorrect interventions. 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 a written test that will focus essentially on the following topics: reactions of organic compounds, description of reaction mechanisms, nomenclature of organic compounds and absolute configuration, biomolecules, degradation, modification and preservation of materials present in artistic artifacts. 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 organic compounds and materials. 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 year and consists of frontal lectures.
SUGGESTED BIBLIOGRAPHY	Brown – Chimica Organica – EdiSes Dispense di riferimento

SYLLABUS

Hrs	Frontal teaching
3	Introduction - Ionic and covalent bonds. Atomic orbitals. Hybridization. Electronegativity and polarity. Oxidation number. Bond dissociation energies. Resonance. Electrophilic and nucleophilic reagents. Acids and bases. Resonance. Isomerism.
2	Alkanes - Nomenclature. Physical properties. Newman projection. Conformational analysis. Relative stability of cycloalkanes: ring strain. conformational analysis. Polycyclic structures . Sources. Petroleum. Petrol
2	Alkenes – Geometric isomers. Nomenclature. Physical properties. Terpenes. Alkynes. Electrophilic polar addition reactions. Catalysis. Carbocations. Oxidation and reduction. Glicols
2	Alkyl halides - Nomenclature. Physical properties. Nucleophilic displacement. Nucleophilic reagents and bases. Leaving group.
3	Polymers derived from ethylene. Teflon. Geometry of polymers. Atactic. Isotactic. Polymers derived from dienes. Rubber. Vulcanization
2	Elimination. Alcohols. Ethers. Epoxides. Dehydration of alcohols. Oxidation. Opening epoxides. Polyethers.
2	Aldehydes. Ketones Nucleophilic addition. Addition of HCN, alcohols, ammonia, hemiacetals, acetals, imines. Reduction of aldehydes and ketones.
3	Carboxylic acids. Acidity. Acyclic nucleophilic substitution. Salts. Hydrolysis. Buffers.
3	Esters. Fisher esterification. Ester hydrolysis. Waxes. Polyesters.

SYLLABUS

Hrs	Frontal teaching
3	Lipids. Fat. Saponification. Soaps. Micelles. Detergents. non-ionic soaps. Drying oils.
3	Amines: structure and nomenclature. Basicity. Buffers. Polyamides. Nylon
2	Benzene. Nomenclature of substituted benzenes. SEA. Halogenation. Alkylation. Polynuclear aromatic hydrocarbons.
1	Phenols. Acidity. Phenolic resins, urea resins, epoxy resins.
3	Stereochemistry – Optical isomerism. Specific rotation. Symmetry elements. Chiral molecules. Fisher projection. Enantiomers and racemic forms. Relative and absolute configuration. Diastereomers. Meso structures. Resolutions of racemic forms.
3	Carbohydrates. – Monosaccharides. Cyclic structure of monosaccharides. Disaccharides and oligosaccharides. Polysaccharides. Starch. Cellulose. Synthetic cellulose derivatives. Paper. Wood. Vegetal fibers
3	Proteins. - Amino acids. acidic and -basic properties of amino acids. Polypeptides and proteins. Animal fibers.
2	Organic products for bacterial disinfection and protection of the art-facts
6	Introduction to spectrometry. Mass spectrometry. Spectroscopy of nuclear magnetic resonance. Infrared and Raman spectroscopy. Ultraviolet spectroscopy.