



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze Agrarie, Alimentari e Forestali		
ACADEMIC YEAR	2017/2018		
BACHELOR'S DEGREE (BSC)	AGRICULTURAL SCIENCES AND TECHNOLOGIES		
SUBJECT	ORGANIC CHEMISTRY		
TYPE OF EDUCATIONAL ACTIVITY	A		
AMBIT	50126-Discipline chimiche		
CODE	01933		
SCIENTIFIC SECTOR(S)	CHIM/06		
HEAD PROFESSOR(S)	PACE ANDREA	Professore Ordinario	Univ. di PALERMO
OTHER PROFESSOR(S)			
CREDITS	9		
INDIVIDUAL STUDY (Hrs)	165		
COURSE ACTIVITY (Hrs)	60		
PROPAEDEUTICAL SUBJECTS	01900 - GENERAL AND INORGANIC CHEMISTRY		
MUTUALIZATION			
YEAR	1		
TERM (SEMESTER)	2° semester		
ATTENDANCE	Not mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	<p>PACE ANDREA</p> <p>Tuesday 9:00 10:00 Viale delle Scienze - Edificio 17 - Corridoio "Chimica Organica"</p> <p>Thursday 9:00 10:00 Viale delle Scienze - Edificio 17 - Corridoio "Chimica Organica"</p>		

DOCENTE: Prof. ANDREA PACE

PREREQUISITES	Ability to apply logic to the comparison of physical properties. Knowledge and ability to apply the concept of percentage and of proportions. Knowledge of basic principles of general chemistry. Ability to draw simple geometrical shapes (triangles, squares, pentagons, hexagons and circles) and to identify 90, 120, and 180 degrees angles.
LEARNING OUTCOMES	Ability to recognize functional groups of various classes of organic compounds including those of biological interest. Ability to rationalize the reactivity of the functional groups and to autonomously predict the reaction outcome. Ability to properly use the language, terms and formalisms of organic chemistry. Ability to understand at the molecular level, the reaction mechanisms and their application in biochemical processes.
ASSESSMENT METHODS	The final exam consists of a written test containing 10 questions, with a score of 1 point each, and 10 questions with a score of 2 points each, for a total score ranging between 0 and 30. Each question requires writing a straightforward answer or drawing structures and reaction mechanisms. Typical examples of final tests are published in the portal or provided upon request. Each answer can receive partial scoring (at 0.25 incremental values) depending on the type and number of mistakes. For total scores having different than zero decimals, the final score will be rounded up to the next entire value. For instance, a score of 17,00 will be considered as failed exam, while a score of 17,25 will be rounded up to 18 and allows to pass the exam. The highest score of 30 cum laude will be assigned after evaluating the overall clarity of written tests which have received a total score of 30,00.
EDUCATIONAL OBJECTIVES	Understanding of general aspects, fundamental principles and technical language/ formalisms of organic chemistry. Knowledge of the various classes of organic compounds and reactions, of the chemical behaviour of functional groups associated to structural aspects. Understanding of basic concepts for the study of biomolecules and biochemical processes, particularly those of natural origin relevant for a graduated student in Agricultural Sciences and Technologies.
TEACHING METHODS	60 hours of activities including lectures (48) and classwork (12) with interactive involvement of students to gain real time feedback on concepts comprehension.
SUGGESTED BIBLIOGRAPHY	W. H. Brown, C. S. Foote, B. L. Iverson, E.V. Anslyn "Chimica Organica", Edises W. H. Brown, T. Poon, "Introduzione alla Chimica Organica", Edises

SYLLABUS

Hrs	Frontal teaching
2	Atoms of H, C, N, O, P, S and halogens. Electronic configuration, electronegativity, atomic orbitals and hybridization. The chemical bond in organic compounds, hybridization and resonance, bond polarity and molecule polarity, intermolecular interactions.
2	Acids and bases in organic chemistry; comparing their strength on the basis of their molecular structure. Electrophiles and Nucleophiles.
5	Classification of isomers: enantiomers and diastereomers. Chiral molecules, absolute configurations (R/S) – Optical activity and racemates – Compounds containing more than one asymmetric center. Racemates resolution – The formation of stereoisomers in the reaction mechanism
2	Alkanes reactivity: combustion and halogenation – Haloalkanes - Nucleophilic substitution
3	Structural aspects and nomenclature of alkenes and alkynes – geometrical isomerism in alkenes and cycloalkanes – E/Z absolute configuration. Alkene reactivity: electrophilic addition. Carbocations stability, allylic systems. Dienes: structure and reactivity.
3	Alcohols and polyols: structure, nomenclature and reactivity. Amines: structure, nomenclature, basicity and reactivity
6	Aromaticity - Benzene and derivatives – Electrophilic and Nucleophilic Aromatic Substitution – Electronic effects of substituents – Phenols – Aryl halides.
6	Carbonyl compounds: aldehydes and ketones. Nucleophilic addition – hemiacetals and acetals, cyanhydrines, imines, enamines. Geometrical isomerism of C=N. Redox reactions. Acidity of alpha hydrogens. Keto-enol tautomerism. Carbanions – Aldolic condensations.
6	Carboxylic acids and their derivatives. Nucleophilic acyl substitution – Acyl chlorides, anhydrides, thioesters, esters and lactones, amides and lactams, nitriles. Esterification and hydrolysis- Claisen condensation – Malonic synthesis – Oxyacids – ketoacids – dicarboxylic acids – Lipids – Phosphoric esters – structural features of steroids.
6	Carbohydrates, monosaccharides, steric series – cyclic structures – redox reaction of carbohydrates – glycosides – ribose – deoxyribose – glucose – galactose – fructose – disaccharides and polysaccharides
4	Aminoacids: structure and configuration – acid-base equilibria – isoelectric point. peptide bond – synthesis and analyses of peptides.
3	Heteroaromatic compounds: pyrrole thiophene, furan, imidazole, pyridine, pyrimidine – annular and side-chain tautomerism - Purine and Pyrimidine nucleobases – structural aspects of nucleosides and nucleotides

Hrs	Practice
12	Molecular polarity, intermolecular interactions, structural isomerism, basicity and acidity order, how to complete a chemical reaction, how to describe a reaction mechanism, structure of biomolecules (lipids, nucleotides, carbohydrates and peptides) - Classwork on typical written exams.