Main course information	
Academic subject	Organic Chemistry I.C.
Degree course	Biological Sciences
Classe di laurea	L13
ECTS credits (CFU)	7
Compulsory attendance	Yes
Teaching language	Italian
Accademic Year	2019/2020

Docente responsabile	
Name & SURNAME	Angelo NACCI
email	angelo.nacci@uniba.it
Tel.	+39.080.544.2499
Tutorial time/day	Tuesday – Wednesday h 10.00 - 12.00

Course details	Study area	SSD code	Type of class
		CHIM/06	Lecture/workshop

Teaching schedule	Year	Semester
	I	II

Modalità erogazione	CFU/ECTS	Lessons (hours)	CFU/ECTS lab	Lab hours	CFU/ECTS tutorial/workshop	Tutorial/workshop hours	CFU/ECTS field trip	Field trip Hours
	5	40	-	-	2	30	-	-

Time management	Total hours	Teaching hours	Self-study hours
	175	70	105

Academic Calendar	First lesson	Final lesson
	02.03.2020	12.06.2020

Syllabus	
Course entry requirements	-
Expected learning outcomes (according to Dublin Descriptors) (it is recommended that they are congruent with the learning outcomes contained in A4a, A4b, A4c tables of the SUA-CdS)	
Knowledge and understanding	Basic knowledge of Chemistry
Applying knowledge and understanding	Knowing how to interpret the fundamental laws of organic chemistry. Acquisition of wide-ranging methodological and instrumental procedures for biological research
Making informed judgements and choices	Acquisition of conscious autonomy in areas related to the recognition of organic functional groups, to the synthesis and reactivity of organic molecules and to their bioactivity
Communicating knowledge and understanding	Acquisition of vocabulary and terminology related to organic chemistry in order to understand the concepts of related disciplines such as biochemistry and molecular biology and to deepen the topics through specific bibliography
Capacities to continue learning	Acquisition of the ability to investigate and read the evolution of the discipline with a critical spirit, through the consultation of texts and databases

Syllabus	
Course content	Review of the structure of the atom. Electronic configuration and chemical bonding. Carbon hybridization. **Alkanes**: Nomenclature. Position and conformational isomerism. Origin: oil. Halogenation and combustion reactions. Cycloalkanes. Bayer theory. Cyclohexane. Conformational and geometric isomerism in cycloalkanes. The concept of chemical reaction. Activation energy. Reaction mechanisms. The concept

	of electrophile and nucleophile. Carbocations and carbanions. Acids and bases according to Brønsted and according to Lewis. pKa scale. **Alkenes and alkynes**: Nomenclature. Geometric isomerism. Electrophilic addition reactions to alkenes: general mechanism. Addition reactions: hydracids, water, halogens, hydroboration. Regiochemistry of addition reactions: Markovnikov's rule. Oxidation reactions with peracids, permanganate and ozone. Stereochemistry of oxidation reactions. Notes on the polymerization reactions of alkenes. **Aromatic hydrocarbons.** Benzene: structure, aromaticity and stabilization energy. Naphthalene and anthracene. Mechanism of aromatic electrophilic substitution reactions. Friedel-Crafts halogenation, nitration, alkylations and acylations. Disubstitution: directing effect on aromatic ring. **Optical isomerism**: Chirality and symmetry elements. Optical activity, polarized light and rotating optical power. Enantiomers, racemes and diastereoisomers. Meso compounds and epimers. Absolute configuration of chiral carbons. **Alkyl Halides**: Nomenclature. Aliphatic nucleophilic substitution reactions SN1 and SN2: Stereochemistry. Elimination reactions. Competition between substitution and elimination mechanisms. **Alcohols and Glycols**: Nomenclature. Acidity of alcohols. Alkoxides. Dehydration of alcohols to alkenes. Williamson synthesis of ethers. Alkyl halides from alcohols. Oxidation of alcohols to carbonyl compounds. Glycols and glycerol: synthesis and properties. **Ethers, epoxides and phenols**: nomenclature and synthesis. **Aldehydes and Ketones**: Nomenclature. Carbonyl structure. Nucleophilic additions to carbonyl: Acetals and hemiacetals, Aldimine. Stereochemistry of nucleophilic additions to the carbonyl. Reduction and oxidation. Enols and enolates: keto-enol tautomerism and its importance in metabolic processes. **Carboxylic Acids**: Nomenclature. Carboxyl structure. Acidity. Synthesis methods. Derivatives of carboxylic acids. Acyl halides, nitriles and anydrides. Fatty acids and their salts. Soaps. **Esters**: Nomenclature. Fisher esterification. Saponification. Lipids, phospholipids and their biological importance. **Amides**: Structure and Synthesis. Biological importance of amides. **Carbon-carbon bond formation** reactions: Aldol condensations. Claisen reactions. Similarity between Claisen condensation and that of thiolesters such as coenzyme A in the biosynthesis of fatty acids. **Amines**: Nomenclature. Basicity of amines. Synthesis of amines: aminolysis of alkyl halides. Reductive amination and reduction of nitriles. Biogenic amines. **Carbohydrides**: Aldoesosi: Glucose, mannose and galactose. Fructose. Anomers. Epimers. Glucosides and their biological importance. Pentoses: ribose, 2-deoxyribose, xylose, arabinose and ribulose. N-ribosidi. Glucosamine. Disaccharides: maltose, cellobiose, lactose, sucrose. Polysaccharides: starch, cellulose, glycogen and their structure. **Aminoacids**: types of amino acids. Chemical-physical characteristics: solubility, acidity and basicity. Isoelectric point. Stereochemistry. Synthesis of amino acids. Volhard method and transamination. Peptide bond. **Proteins**: primary, secondary, tertiary and quaternary structure. Denaturation. ATP and notes on metabolism and biochemical energy. **Aromatic heterocycles**: pyrrole, furan, thiophene, imidazole, tiazole, pyridine, pyrimidine and purine. Purine and pyrimidine bases. Keto-enol tautomerism in purine and pyrimidine bases. **Nucleotides** and summary of nucleic acids.
Course books/Bibliography	1) "Chimica Organica" Brown – Foote – Iverson – Anslyn – EdiSES. 2) "Chimica Organica" Un approccio biologico - J. McMurry – Zanichelli
Notes	PDF file to complete the study
Teaching methods	Frontal lessons using a traditional blackboard
Assessment methods (indicate at least the type written, oral, other)	Oral interview and use of traditional blackboard
Evaluation criteria (Explain for each expected learning outcome what a student has to know, or is able to do, and how many levels of achievement there are	Students must demonstrate: - full mastery in writing and nomenclature of the main classes of organic compounds; - ability to orientate in the reaction mechanisms and predict the products of a single organic reaction; - mastery of stereochemistry; - good knowledge of the main classes of biomolecules; - ability to make connections with the contents of other courses.
Further information	