COURSE OF STUDY *Management of Green Spaces, Forests and Protected Areas*
ACADEMIC YEAR *2023-2024*
ACADEMIC SUBJECT ORGANIC CHEMISTRY

General information	
Year of the course	*1°year*
Academic calendar (starting and ending date)	*2° semester – 4th march 2024 – 14th June 2024*
Credits (CFU/ETCS):	8 CFU
SSD	*CHIM/06*
Language	*Italian*
Mode of attendance	*Optional, strongly recommended*

Professor/ Lecturer	
Name and Surname	*Danilo Vona*
E-mail	*danilo.vona@uniba.it*
Telephone	
Department and address	*D.i.S.S.P.A. – room 5, I° floor, Chimica e Biochimica Agraria*
Virtual room	*Teams*
Office Hours (and modalities: e.g., by appointment, on line, etc.)	*Monday,h 3:00 p.m.*

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
200	*48*	*28 (working group)*	*124*
CFU/ETCS			
8	*6*	*2*	

Learning Objectives	*Knowledge of the properties of matter (structural, interaction). Preparation of solutions. Recognition of inorganic and organic compounds. Knowledge of functional groups in organic chemistry, reactivity and properties. The teaching is oriented around the understanding of the chemical processes that underlie natural phenomena. The analysis of the scientific background and the development of autonomal study and basic and applied research constitute a goal. Use of congruent lexicon in scientific English. Ability to formulate hypotheses and define theories. Technical-practical objectives.*
Course prerequisites	*Fundamentals of general and inorganic chemistry; rudiments of mathematics and calculation.*

Teaching strategie	*Frontal lectures, use of multimedia inputs, brain storming, collective and individual exercises, use of molecular models, visual and written ideation.*
Expected learning outcomes in terms of	
Knowledge and understanding on:	○ *Knowledge of chemical notation, IUPAC nomenclature, conventions for graphic representation of reactions in inorganic and organic chemistry* ○ *Knowledge of inorganic and organic compounds and syntheses applied to the biological world* ○ *Knowledge of functional groups and overview on reactivity, preparation,*

	stereochemistry and properties ○ *Applications and connection of organic chemistry to nature and industrially exploited processes*
Applying knowledge and understanding on:	○ *Ability to write chemical structures from names and vice versa* ○ *Prediction of the chemical behavior, aiming to plan a synthetic preparation* ○ *Applications of laws and stoichiometry* ○ *Ability to predict stereochemical behavior and applicability of specific compounds*
Soft skills	*Making informed judgments and choices* ○ *Ability to apply chemical theory to daily processes* ○ *Problem solving* ○ *Ability to independently study and research using scientific literature and databases* ○ *Development of practical sense of theoretical study and technological impact* *Communicating knowledge and understanding* ○ *Written and spoken forms of communication ability related to information, problems, solutions* ○ *Didactic, Scientific and informative discussion* *Capacities to continue learning* ○ *Updating of literature through self-study* ○ *Introduction of new case studies* ○ *Possibility of writing a case study*
Syllabus	
Content knowledge	***General and inorganic chemistry:*** *Atomic structure and models. Electronic configuration. Atoms, isotopes, molecules and molecular properties. Minimal and structure formulas. Periodic properties. Mole. Intra-, intermolecular chemical bonds. Polarity and dipole moment. Octet rule, valence. Molecular geometry. Hybridization theory. Resonance.* *Chemical nomenclature, oxidation numbers. Chemical reactions: types and stoichiometry. States of matter: ideal gas laws, mixtures and kinetic theory. Solid state of matter: allotropic forms, crystallinity. Properties of the liquid state and state diagrams. Phases.* *Solutions, solubility, expression of concentrations, Henry and Raoult's laws, colligative properties, electrolytes.* *Chemical thermodynamics, variables, state functions, enthalpy, entropy and spontaneity of reactions.* *Chemical equilibria, Le Chatelier's principle, equilibrium constants, equilibria in solution, acid-base theories, pH calculation, solubility.* *Chemical kinetics, reaction rate, reaction order, molecularity, catalysis.* ***Organic chemistry:*** *Carbon hybridization. Saturated and unsaturated hydrocarbons. Alkanes, alkenes, alkynes, cycloalkanes: nomenclature, structure, properties, reactivity. Stereoisomerism. Configurational and conformational stereoisomers. Chirality. Enantiomers and diastereoisomers. Optical activity. Geometric isomerism in alkenes and dienes. Natural hydrocarbons: terpenes and terpenoids. Focus on double and triple bond reactivity: electrophilic additions of hydrogen halides to the double bond, hydration. Markovnikov rule. Nomenclature, reactivity, chemical-physical properties and aliphatic nucleophilic substitution and elimination reactions. Benzene and aromatic hydrocarbons. Aromaticity and chemical-physical properties of aromatic compounds. Nomenclature. Natural aromatic molecules: spice monomers, flavors and*

	polyphenols. Alkaloids. Focus on electrophilic aromatic substitution reactions. Acidity of phenols. Alcohols, ethers, thiols: nomenclature, properties, reactivity. Molecular rancidity in nature. Amines. Structure, nomenclature, chemical-physical properties and reactivity. Natural aliphatic and aromatic amines, case of histamine in conservation. Basicity of amines. Aldehydes and ketones. Structure, nomenclature and chemical-physical properties. Reactivity of the carbonyl group and oxidation and reduction reactions. Nucleophilic addition reactions to the carbonyl. Acid and base catalysis. Carbon, nitrogen and oxygen nucleophiles. Condensation reactions. Carboxylic acids and derivatives. Nomenclature, chemical-physical properties and reactivity. Derivatives of carboxylic acids. Phytohormones. Structural effects on the acidity and basicity of organic compounds. Saponifiable and non-saponifiable lipids. Surfactants. Triglycerides, phosphoglycerides, steroids, fat-soluble vitamins. Terpenoids in plant:plant and plant:parasites communication. Carbohydrates. General structures. Monosaccharides: aldoses and ketoses. Reactivity, focus on mutarotation. . Natural glycosides. Reactions of monosaccharides: oxidation and reduction. Disaccharides: sucrose, galactose, maltose and cellobiose. Polysaccharides: starch and cellulose. Amino acids. Bases of sugar digestibility. Structures of natural amino acids and acid-base features. Peptide bond. Nucleic acids. Structures of nitrogenous bases, nucleosides, nucleotides. Phosphodiester bond.
Texts and readings	i. *William H. Brown, Brent L. Iverson, Eric V. Anslyn, Christopher S. Foote, Chimica Organica, V Edizione, , 2015 EdiSES S.r.l. Napoli; letteratura scientifica recente* ii. *Manotti Lanfredi-Tiripicchio, Fondamenti di Chimica, Casa Editrice Ambrosiana.* iii. *Potenzo Giannoccaro. Le basi della chimica. Atomi e molecole, strutture e reattività. Edises ed.*
Notes, additional materials	*The text serves as a support for didactics. The entire course is based on book, lectures. The student mainly uses notes for the personal preparation of the course. Use of molecular models. Exercises.*
Repository	*Teachers and lecturers supply the study materials.*

Assessment	
Assessment methods	*Intermediate exam, final oral exam*

Assessment criteria	• *Knowledge and understanding*
	  ○ *Testing of the knowledge using the written intermediate exam and the final oral exam*
	• *Applying knowledge and understanding*
	  ○ *Testing of the theory to case study*
	• *Autonomy of judgment*
	  ○ *Independent problem solving ability*
	• *Communicating knowledge and understanding*
	  ○ *Adequate language*
	  ○ *Cultural and content correctness*
	  ○ *Use of the suitable chemical notification*
	• *Communication skills*
	  ○ *All the likely communication skills presented*
	• *Capacities to continue learning*
	  ○ *Problem solving during the course attending*

Final exam and grading criteria	*Application of prerequisites, verification of lack or presence of gaps, verification of theory knowledge, correctness of chemical graphics, problem solving.*
Further information	
	.