

General Information	MASTER DEGREE IN BIOTECHNOLOGIES
Title of the subject	Applied Organic Chemistry
Degree Course (class)	Industrial and Environmental Biotechnology (LM-8)
ECTS credits	5
Compulsory attendance	Yes
Language	Italian
Academic year	2020-2021

Subject Teacher		
Name and Surname	Maria Annunziata M. Capozzi	
email address	Maria.capozzi@uniba.it	
Place and time of reception	Every day at room 214 dep. of Chemistry or Teams after contacting email	
ECTS credits details	Discipline sector (SSD)	Area
	CHIM/06	---

Study plan schedule	Year of study plan		Semester	
	I		II	
Time management	Lessons	Laboratory	Exercises	Total
CFU	5			5
Total hours	125			125
In-class study hours	40			40
Out-of-class study hours	85			85

Syllabus	
Prerequisites / Requirements	
<p>The student must have acquired the notions of a basic organic chemistry course.</p>	
Expected learning outcomes (according to Dublin descriptors)	
Knowledge and understanding	The course aims to teach the student the basic methods of design, synthesis and structural characterization (¹ H-NMR) of molecules of applicative interest. The course also proposes to acquire basic notions on the main green chemistry methodologies, as well as on the most important chemical modifications to be carried out on biomass in order to enhance them.
Applying knowledge	The course provides the tools for the design, modification and / or development of bioactive molecules useful in the industrial field. It

	also aims to provide useful information for understanding the structure and the main chemical-physical properties of synthetic and natural molecules and important macromolecules in the environmental field or useful for biotechnological applications. The acquisition of a formally correct language is taken care of, the ability to express the contents in a clear and linear way is stimulated, connections between the different parts of the course are underlined.
Making informed judgments and choices	The student will be able to identify the central aspects of the proposed problems and bring them back to acquired concepts by proposing innovative solutions. Furthermore, the student will be able to critically analyze and interpret the experimental data in terms of its scientific value. The acquisition of independent judgment will be verified by evaluating the topics covered by the teaching and assessing the degree of autonomy.
Communicating knowledge	Thanks to adequate written and oral communication skills and tools and modern IT skills, the student will be able to critically analyze, propose and discuss with interlocutors of similar and different professional backgrounds on current biotechnological issues.
Capacities to continue learning	The student will have acquired sufficient ability to learn and deepen the main issues of organic chemistry applied to biotechnological research and current problems concerning the industrial and environmental sector through the consultation of bibliographic material in paper and electronic form. The learning ability is verified by analyzing the knowledge of the topics covered by the teaching by marking the questions required in the exam.
Study Program	
Content	<ol style="list-style-type: none"> 1) Synthetic strategies for the formation of the C-C bond. Retrosynthetic analysis for the preparation of organic molecules. 2) Synthetic methodologies of applicative interest for the preparation of optically active molecules. 3) Polymers and biopolymers: main classes of synthetic polymers; biodegradable polymers; modification of biopolymers; biocompatible polymers for biomedical applications. 4) Strategies for the realization of chemical processes with low environmental impact (elements of Green Chemistry). 5) Methods of chemical modification of biomass to obtain chemical products. 6) Elements of ¹H-NMR spectroscopy.
Bibliography and textbooks	Material screened in the classroom and review articles taken from the literature on topics of the course
Notes to textbooks	To be consulted according to the instructions received in class by the teacher
Teaching methods	Lectures on theory, examples on solving proposed problems.
Assessment methods (oral, written, ongoing assessment)	Written with open answers

Evaluation criteria (describe criteria for each of the above expected outcomes)	The open-ended written test consists of 5 questions on the various topics covered by the lectures. Each of them is given a maximum score of 6 points if the contents expressed as a whole are correct and exhaustive. To this is added the resolution of a ¹ H-NMR spectrum of an unknown molecule.
Further information	

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ECTS credits	I
Compulsory attendance	Yes
Language	Italian
Academic year	2020-2021

Subject Teacher		
Name and Surname	Gianluca Maria Farinola	
email address	gianluca maria.farinola@uniba.it	
Place and time of reception	To be planned with the teacher by e-mail	
ECTS credits details	Discipline sector (SSD)	Area
	CHIM/06	---

Study plan schedule	Year of study plan		Semester	
	I		II	
Time management	Lessons	Laboratory	Exercises	Total
CFU		I		I
Total hours		25		25
In-class study hours		12		12
Out-of-class study hours		13		13

Syllabus

Prerequisites / Requirements	The knowledge of basic principles learnt in the Organic Chemistry course is required
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Expected learning outcomes (according to Dublin descriptors)

Knowledge and understanding	The course aims at providing the basic knowledge of methods of synthesis, purification and chemical characterization of organic molecules (<i>Dublin 1 Descriptor</i>). The student will extend the basic knowledge in Organic Chemistry, focusing attention on the study of experimental methods used in lab for preparation, extraction, purification, spectroscopical and morphological characterization of molecular, polymeric and biohybrid materials for environmental and bioenergetic applications.
Applying knowledge	The course aims at providing knowledge on the application of theoretical principles by lab experiments including all the steps of synthesis and work-up of organic products (<i>Dublin 2 Descriptor</i>). Attention will be devoted to the synthesis in aqueous media of biocompatible organic polymers and nanostructured materials for

	environmental and bioenergetic applications.
Making informed judgments and choices	The student will get experience in the critical observation and rationalization of experimental results achieved in lab. The student will gain capability of critically observing experimental results in lab, identifying the basic principles that determine and lead to the experimental evidence.
Communicating knowledge	The student will get competences to analyze and discuss on scientific topics of current interest for communities involved in biotechnological research fields.
Capacities to continue learning	Learning capacity will be evaluated during the exam, considering the ability of the student to rationalize experimental evidences by theoretical principles.
Study Program	
Content	1) Green synthetic methods in aqueous solution of organic molecules and biopolymers. 2) Chemical modification of nanostructured hybrid materials for application in environmental and biomedical sciences and in energy conversion. 3) Extraction and purification methods of organic and biohybrid materials. 4) Spectroscopical and morphological characterization of organic molecules and biopolymers.
Bibliography and textbooks	Digital and paper-based material provided during lessons
Notes to textbooks	To be used according to suggestions by the teacher
Teaching methods	A combined theoretical-practical teaching method will be used, by means of paper-based and digital learning material.
Assessment methods (oral, written, ongoing assessment)	Written assessment method
Evaluation criteria (describe criteria for each of the above expected outcomes)	The evaluation will be made considering: 1. the student's scientific knowledge; 2. the accuracy and precision of answers provided; 3. the use of proper scientific language; 4. the student's autonomy of judgement and the logic skill to solve a question availing of all the principles learnt in the course. The fulfilment of the above mentioned aspects 1. and 2. is necessary to pass the exam with the minimal score (18/30). Higher scores will be provided when all the aspects 1-4 will be fulfilled
Further information	