



# UNIVERSITÀ DI PAVIA

Anno Accademico 2021/2022

FOOD BIOTECHNOLOGIES	
Enrollment year	2021/2022
Academic year	2021/2022
Regulations	DM270
Academic discipline	CHIM/10 (FOOD CHEMISTRY)
Department	DEPARTMENT OF BIOLOGY AND BIOTECHNOLOGY "LAZZARO SPALLANZANI"
Course	ADVANCED BIOTECHNOLOGY
Curriculum	PERCORSO COMUNE
Year of study	1°
Period	2nd semester (01/03/2022 - 14/06/2022)
ECTS	6
Lesson hours	48 lesson hours
Language	Italian
Activity type	ORAL TEST
Teacher	PAPETTI ADELE (titolare) - 3 ECTS BRAGLIA LUCA - 3 ECTS
Prerequisites	Basic knowledge in organic chemistry, biochemistry and molecular biology
Learning outcomes	The course aims to provide the basic knowledge on the chemical composition of foods (nutrients and minor components with bio-functional properties); evaluate the effects of technological treatments on food components; scrutinize on food preservation technologies and on food additives. The second part of the course aims to identify and illustrate biotechnological approaches applied to the agro-food chain, involved in the food production and improvement, including energy and environmental aspects, as well as to deal with biotechnological methods applied to food analysis and authentication.



Inorganic nutrients: 1) water: physical state of water in foods, water activity ( $a_w$ ), food stability, and mineral waters; 2) minerals: major anions and cations, their food sources. Organic food nutrients: 1) lipids: chemical structures, lipids in foods, lipid degradations, antioxidants; 2) carbohydrates: chemical structures, simple and complex sugars in foods, sweeteners, soluble and insoluble dietary fibers; 3) proteins: aminoacids, structure and function of proteins in foods, biological and nutritional value of animal and vegetable proteins, anti-nutritional factors; 4) fat- and water-soluble vitamins: physico-chemical properties, distribution in foods.

5) Food additives and relative regulation

6) preservation technologies based on heat, refrigeration and water elimination.

Second part: the biotechnologies from "farm to fork"; The microbial productions: functional foods, bioactive compounds and probiotics. Microbial enzymes in the food industry: production and uses. Secondary plant metabolites: plant breeding and plant-assisted selection techniques; in vitro culture techniques, genetic transformation and genome editing. Bioreactors and biotech productions: new sources from algae, cyanobacteria and duckweed. Enriched products and bio fortification: from seeds to the ready-to-eat products.

Environmental productions and novel food: the use of fungi and bacteria (bioremediation and mycorrhizal inocula); jellyfish and insects as alternative protein sources.

Biotechnology in the food analysis, purposes and methods: food authentication, traceability and labeling. Biochemical and molecular techniques (genomics, proteomics and metabolomics). DNA-based methods for the qualitative and quantitative analysis of food products.

Food law general principles food certifications.

## Teaching methods

Lectures in presence with a final discussion about the topic of the lecture.

**Reccomended or required  
readings**

- Prodotti dietetici. F.Evangelisti - Restani. Seconda Edizione-PiccinEd.2011
- La Chimica degli Alimenti T.P. Coultate Casa Editrice ZANICHELLI-2005
- Chimica degli Alimenti P. Cabras, A. Martelli Piccin Ed. –2004
- Food Chemistry Belitz-Grosh-Schieberle. Springer Ed. 2009.
- International scientific papers provided together with the presentation of the single lessons.





Student performance will be assessed by 4 open-ended questions (two for each of the parts making up the module) at the end of the course or in all the examination sessions.

Exam duration: 2 hours



